

THE LIVING AGE.

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THE OLD FOLKS' ROOM.

THE old man sat by the chimney side—

His face was wrinkled and wan,
And he leaned both hands on his stout oak cane,
As if all his work were done.

His coat was of good old-fashioned gray,
The pockets were deep and wide,
Where his "specks" and his steel tobacco box,
Lay snugly side by side.

The old man liked to stir the fire,
So near him the tongs were kept;
Sometimes he mused as he gazed at the coals,
Sometimes he sat and slept.

What saw he in the embers there?
Ah! pictures of other years;
And now and then they wakened smiles.
But oftener started tears.

His good wife sat on the other side,
In a high-backed, flag-seat chair;
I see 'neath the pile of her muslin cap
The sheen of her silvery hair.

There's a happy look on her aged face,
As she busily knits for him,
And Nellie takes up the stitches dropped,
For grandmother's eyes are dim.

Their children come and read the news,
To pass the time each day;
How it stirs the blood in an old man's heart,
To hear of the world away.

'Tis a homely scene, I told you so,
But pleasant it is to view;
At least I thought it so myself,
And sketched it down for you.

Be kind unto the old, my friend,
They're worn with this world's strife,
Though bravely once perchance they fought
The stern, fierce battle of life.

They taught your youthful feet to climb
Upward life's rugged steep;
Then let us gently lead them down
To where the weary sleep.

AN IDEAL.

WHILE the grey mists of early dawn
Were lingering round the hill,
And the dew was still upon the flowers,
And the earth lay calm and still,
A winged Spirit came to me,
Noble, and radiant, and free.

Folding his blue and shining wings,
He laid his hand on mine.
I know not if I felt, or heard
The mystic word divine,
Which woke the trembling air to sighs,
And shone from out his starry eyes.

The word he spoke, within my heart
Stirr'd life unknown before,
And cast a spell upon my soul
To chain it evermore;

Making the cold dull earth look bright,
And skies flame out in sapphire light.

When noon reel'd from the heavens, and man
Through busy day toil'd on,
My Spirit droop'd his shining wings
His radiant smile was gone;
His voice had ceas'd, his grace had flown,
His hand grew cold within my own.

Bitter, Oh bitter tears, I wept,
Yet still I held his hand,
Hoping with vague unreasoning hope:
I would not understand
That this pale Spirit never more
Could be what he had been before.

Could it be so? My heart stood still.
Yet he was by my side.
I strove; but my despair was vain;
Vain, too, was love and pride.
Could he have changed to me so soon?
My day was only at its noon.

Now stars are rising one by one,
And evening shades are here;
Near me a household spirit waits,
With tender loving care;
He speaks and smiles, but never sings,
Long since he lost his shining wings.

With thankful true content, I know
This is the better way.
Is not a faithful spirit mine—
Mine still—at close of day?
Yet will my foolish heart repine
For that bright morning dream of mine.
—Household Words.

THREE ROSES.

JUST when the red June roses blow
She gave me one,—a year ago.
A rose whose crimson breath reveal'd
The secret that its heart conceal'd,
And whose half shy, half tender grace
Blush'd back upon the giver's face.
A year ago—a year ago—
To hope was not to know.

Just when the red June roses blow
I pluck'd her one,—a month ago.
Its half-blown crimson to eclipse,
I laid it on her smiling lips;
The balmy fragrance of the south
Drew sweetness from her sweeter mouth.
Swiftly do golden hours creep,—
To hold is not to keep.

The red June roses now are past,—
This very day I broke the last,
And now its perfum'd breath is hid,
With her, beneath a coffin-lid;
There will its petals fall apart,
And wither on her icy heart:
At three red roses' cost
My world was gain'd and lost.
—Household Words.

From Blackwood's Magazine.

A LEGEND OF GIBRALTAR.

BY COLONEL E. B. HAMLEY, AUTHOR OF *LADY LEE'S WIDOWHOOD*.

CHAPTER I.

THE Governor's residence at Gibraltar was, in days of Spanish domination, a religious house, and still retains the name of the Convent. Two sides of a long quadrangular gallery, traversing the interior of the building, are hung with portraits of officers present at the great siege in 1779-83, executed in a style which proves that Pre-Raphaelite painters existed in those days. One of these portraits represents my grandfather. To judge from a painting of him by Sir Joshua, and a small miniature likeness, both still in possession of the family, he must have been rather a good-looking old gentleman, with an affable, soldier-like air, and very respectable features. The portrait at the Convent is doubtless a strong likeness, but by no means so flattering; it represents him much as he might have appeared in life, if looked at through a cheap opera-glass. A full inch has been abstracted from his forehead and added to his chin; the bold nose has become a great promontory in the midst of the level countenance; the eyes have gained in ferocity what they have lost in speculation, and would, indeed, go far to convey a disagreeable impression of my ancestor's character, but for the inflexible smile of the mouth. Altogether, the grimness of the air, the buckram rigidity of figure, and the uncompromising hardness of his shirt-frill and the curls of his wig, are such as are to be met with in few works of art, besides the figure-heads of vessels and the sign-boards of country-inns.

However, my grandfather is no worse off than his compeers. Not far from this one is another larger painting, representing a council of officers held during the siege, where, notwithstanding the gravity of the occasion and the imminence of the danger, not a single face in the intrepid assembly wears the slightest expression of anxiety or fear, or, indeed, of any thing else; and though my progenitor, in addition to the graces of the other portrait, is here depicted with a squint, yet he is by no means the most ill-looking individual present. But the illustrious governor, Elliott, has suffered more than anybody at the hands of the artist. Besides figuring in the production aforesaid, a statue of him stands in the Ala-

meda, carved in some sort of wood, unluckily for him, of a durable nature. The features are of a very elevated cast, especially the nose; the little legs seem by no means equal to the task of sustaining the enormous cocked-hat; and the bearing is so excessively military, that it has been found necessary to prop the great commander from behind to prevent him from falling backwards.

My grandfather, John Flinders, joined the garrison of Gibraltar as a major of infantry a few years before the siege. He was then forty-seven years of age, and up to that time had remained one of the most determined old bachelors that ever existed. Not that he ever declaimed against matrimony in the style of some of our young moderns, who fancy themselves too strong-minded to marry; the truth being that they remain single, either because they have not been gifted by nature with tastes sufficiently strong to like one woman better than another, or else, because no woman ever took the trouble to lay siege to them. My grandfather had never married, simply, I believe, because matrimony had never entered his head. He seldom ventured, of his own choice, into ladies' society, but, when he did, no man was more emphatically gallant to the sex. One after one, he saw his old friends abandoning the irresponsible ease of bachelorhood for the cares of wedded life; but while he duly congratulated them on their felicity, and officiated as godfather to their progeny, he never seemed to anticipate a similar destiny for himself. All his habits showed that he had been too long accustomed to single harness to go cleverly as one of a pair. He had particular hours of rising and going to bed; of riding out and returning; of settling himself down for the evening to a book and pipe, which the presence of a helpmate would have materially deranged. And therefore, without holding any Malthusian tenets, without pitying his Benedick acquaintances, or entertaining a thought of the sex which would have been in the least degree derogatory to the character of a De Coverley, his castles in the air were never tenanted by any of his own posterity.

It was fortunate for my grandfather that in his time people did not suffer so much as now from that chronic inflammation of the conscience, which renders them perfectly miserable unless they are engaged in some tangible pursuit—"improving their minds," or "adding

to the general stock of information." A more useless, contented person never existed. He never made even a show of employing himself profitably, and never complained of weariness in maintaining the monotonous jog-trot of his simple daily life. He read a good deal, certainly, but it was not to improve his mind only to amuse himself. Strong-minded books, to stimulate his thinking faculties, would have had no charms for him; he would as soon have thought of getting galvanised for the pleasure of looking at his muscles. And I don't know whether it was not just as well. In systematically cultivating his mind, he would merely have been laying a top-dressing on a thin soil—manuring where there would never have been a crop—and some pleasant old weeds would have been pulled up in the process. A green thistly common, even though a goose could hardly find sustenance there, is nature still, which can hardly be said of a patch of earth covered with guano.

So my grandfather went on enjoying himself without remorse after his own fashion, and never troubled himself to think—an operation that would have been inconvenient to himself, and productive of no great results to the world. He transplanted his English habits to Gibraltar; and, after being two years there, knew nothing more of Spain or Spaniards than the view of the Andalusian hills from the Rock, and a short constitutional daily ride along the beach beyond the Spanish lines, to promote appetite and digestion, afforded him. And so he might have continued to vegetate during the remainder of his service there, but for a new acquaintance that he made about this time.

Frank Owen, commonly called Garry Owen by his familiars, was one of those joyous spirits whose pleasant faces and engaging manners serve as a perpetual act of indemnity for all breaches of decorum, and trespasses over social and conventional fences, committed by them in the gaiety of their hearts. In reproving his many derelictions of military duty, the grim colonel of the regiment would insensibly exchange his habitual tone of severe displeasure for one of mild remonstrance—influenced, probably, quite as much, in secret, by the popularity of the unrepentant offender, as by any personal regard for him. Captain Hedgehog, who had shot a man through the heart for corking his face one night when he

was drunk, and all contact with whose detonating points of honor was as carefully avoided by his acquaintance as if they had been the wires of a spring-gun, sustained Garry's reckless personalities with a sort of warning growl utterly thrown away upon the imperturbable wag, who would still persist, in the innocence of his heart, in playing round the den of this military cockatrice. And three months after his arrival in Gibraltar, being one day detected by a fierce old Spanish lady in the very act of kissing her daughter behind the little *señorita's* great painted fan, his good-humored impudence converted the impending storm into a mild drizzle of reproof, ending in his complete restoration to favor.

This youth had brought with him from England a letter from his mother, a widow lady, an old friend of my grandfather, who had some thirty years before held with her a juvenile flirtation. It recommended to his protection her son Frank, about to join the regiment as an ensign, pathetically enlarging on the various excellencies, domestic and religious, which shone forth conspicuously in the youth's character, and of the comfort of contemplating and superintending which she was about to be deprived. In fact, it had led my grandfather to expect a youth of extreme docility and modesty, requiring a protector rather to embolden than to restrain him. After in vain attempting to espy in his young acquaintance any of the characteristics ascribed to him in his mother's letter, the Major, naturally good-natured and accessible to his youthful comrades, very soon suffered himself to be influenced by the good-humor, vigorous vitality, and careless cleverness of the Ensign, to an extent that caused him sometimes to wonder secretly at his own transformation. His retired habits were broken in upon, one after the other, till he had scarcely a secluded hour in his sixteen waking ones to enjoy alone his book and his pipe. His peaceful quarters, silent in general as a monk's cell, would now be invaded at all sorts of hours by the jovial Garry, followed by the admiring satellites who usually revolved around him; and the Major, with a sound between a groan and a chuckle, would close his well-beloved volume to listen to the facetious details of, and sometimes to participate in, the uncongenial freaks of the humorous subaltern. Once he had actually consented,

at about the hour he usually went to bed, to accompany the youth to a carnival ball—one of a series of entertainments at which the Catholic youth of the city are wont to indemnify themselves for the mortifications of Lent, and where masks, dominoes, and fancy-dresses lend their aid to defeat the vigilance of the lynx-eyed duennas and mammas who look anxiously on, perfectly aware, in general, that their own watchfulness is more to be relied on for nipping in the bud an indiscreet amour, than any innate iciness of temperament or austere propriety in the objects of their care. Not only did the Major mingle in the scene, but he actually, about midnight, found himself figuring in a cotillon with a well-developed señorita of thirteen years, whose glances and deportment showed a precocious proficiency in the arts of flirtation. At this ball Garry had become enamored beyond all former passions (and they were numerous and inconstant, in general, as if he had been a Grand Turk) of one of his partners, a young Spanish lady. Her graceful figure and motions in the dance had at first captivated him—and when, after dancing with her himself, his eloquent entreaties, delivered in indifferent Spanish, had prevailed on her to lift her mask for one coy moment, the vision of eyes and eyebrows (the common beauties of a Spanish countenance), and the clear rosy complexion, a much more rare perfection, then revealed, had accomplished the utter subjugation of his errant fancy. She had vanished from the ball silently and irremediably, as an houri of Paradise from the awakening eyes of an opium-eating Pasha; and all his attempts to trace her, continued unceasingly for a couple of months afterwards, had proved in vain.

One morning my grandfather was seated at breakfast in the verandah of his quarters, situated high up the rock above the town. Below him lay the roofs, terraced and balconied, and populous with cats, for whose convenience the little flat stone squares at the top of most of the houses appeared to have been devised. Tall towers, called mirandas, shot up at intervals, from whose summits the half-baked inhabitants, pent within close walls and streets, might catch refreshing glimpses of the blue sea and the hills of Spain—conveniences destined soon afterwards to be ruined by the enemy's fire, or pulled down to avoid attracting it, and never rebuilt. Beyond the white sunny ridge of the line wall came the sharp

edge of the bay, rising in high perspective to the purple coast of Spain opposite, which was sprinkled with buildings white as the sails that dotted the water. My grandfather was in a state of great sensual enjoyment, sniffing up the odor of the large geranium-bushes that grew in clumps in the little garden in front, and the roses that twined thickly round the trellis of the vine-roofed verandah; sipping thick creamy Spanish chocolate between the mouthfuls of red mullet, broiled in white paper, the flavor of which he was diligently comparing with that of some specimens of the same fish which he remembered to have eaten in his youth in Devonshire; and glancing sideways over the cup at an open volume of Shakspeare, leaned slopingly on the edge of a plate of black figs bursting with ripeness, like trunk-hose slashed with crimson. The Major was none of your skimming readers, who glance through a work of art as if it were a newspaper—measure, weigh it, and deliver a critical opinion on it, before the more reverential student has extricated himself from the toils of the first act or opening chapter; not he; he read every word, and affixed a meaning, right or wrong, to all the hard, obsolete ones. The dramatic fitness of the characters was not to be questioned by him, any more than that of the authentic personages of history. He would reason on their acts and proceedings as on those of his own intimate acquaintances. He never could account for Hamlet's madness otherwise than by supposing the Prince must have, some time or other, got an ugly rap on the head—let fall, perhaps, when a baby, by a gin-drinking nurse—producing, as in some persons he had himself from time to time been acquainted with, a temporary aberration of the wits; a piece of original criticism that has not occurred to any of the other commentators on this much-discussed point. Of Iago he has recorded an opinion in an old note-book still extant, where his observations appear in indifferent orthography, and ink yellow with age, that he was a cursed scoundrel—an opinion delivered with all the emphasis of an original detector of crime, anxious that full though tardy justice should be done to the delinquent's memory. But his great favorite was Falstaff: "A wonderful clever fellow, sir," he would say, "and no more a coward than you or I, sir."

My grandfather proceeded slowly with his meal, holding the cup to his lips with one

hand and turning a leaf with the other—an operation which he was delaying till a great mosquito-hawk (a beautiful brown moth mottled like a pheasant), that had settled on the page, should think proper to take flight. He had lately come from a parade, as was evidenced by his regimental leather breeches and laced red waistcoat; but a chintz dressing-gown and a pair of yellow Moorish slippers softened down the warlike tone of these garments to one more congenial with his peaceable and festive pursuits. Presently the garden door opened, and a well-known step ascended to the verandah. Frank Owen, dressed in a cool Spanish costume, advanced, and, stopping three paces from the Major, took off his tufted sombrero and made a low bow.

"You are the picture, my dear sir," he said, "of serene enjoyment slightly tinged with sensuality. But how long, may I ask, have you taken to breakfasting on spiders?"—pointing, as he took a chair opposite the Major, at an immense red-spotted one that had dropt from the ceiling on the morsel my grandfather was in the act of conveying to his mouth.

The Major tenderly removed the insect by a leg.

"Tis the worst of these al-fresco meals, Frank," said he. "Yesterday I cut a green lizard in two that had got on my plate, mistaking him for a bit of salad—being, as usual, more intent on my book than my food—and had very near swallowed the tail-half of the unfortunate animal."

"There are worse things than lizards in the world," quoth Garry. "Ants, I should say, were certainly less wholesome"—and he directed the Major's attention to a long black line of those interesting creatures issuing from a hole in the pavement, passing in an unbroken series up my ancestor's left leg, the foot of which rested on the ground, then traversing the cloth, and terminating at the loaf, the object of their expedition.

"Bless me," said the Major, as he rose and shook his breeches gently free from the marauders, "I must be more careful, or I shall chance to do myself a mischief. But they're worse at night. I've been obliged to leave off reading here in the evenings, for it went to my heart to see the moths scorching their pretty gauzy wings in the candle till the wicks were half-choked with them."

"Do you know, Major," said Owen, gravely, "that either this insect diet, or the sedentary life you lead, is making you quite fat, and utterly destroying the symmetry of your figure? In another week there will be one unbroken line of rotundity from your chin to your knees."

My grandfather glanced downward at his waistcoat. "No, my boy, no," said he; "if there had been any difference, I should have known it by my clothes. I don't think I've gained a pound this twelvemonth."

"More than a stone," quoth Garry. "We all remarked it on parade to-day—and remarked it with sorrow. Now, look you, a sea voyage is the very thing to restore your true proportions, and I propose that we shall take a short one together."

"A sea voyage!" quoth my grandfather; "the boy is mad! Not if all the wonders seen by Sinbad the Sailor lay within a day's sail. Did I not suffer enough coming here from England? I don't think," said my grandfather with considerable pathos, "that my digestion has ever been quite right to this day."

"Sick of a calm, eh?—Like your friend Mistress Tearsheet," said the youngster. "But I've settled it all, and count on you. Look here," he continued, drawing from his pocket a large printed bill, and unfolding it before my ancestor. At the top appeared in large capitals the words, "Plaza de Toros;" and underneath was a woodcut representing a bull, gazing, with his tail in the air, and an approving smile on his countenance, on the matadore about to transfix him. Then followed a glowing account in Spanish of the delights of a great bull-fight shortly to take place at Cadiz, setting forth the ferocity of the bulls, the number of horses that might be expected to die in the arena, and the fame of the picadores and espadas who were then and there to exhibit.

The Major shook his head—the captivating prospectus had no charms for him: he had not, as I have before said, an inquiring mind, and habit was so strong in him, that a change was like the dislocation of a joint. The Ensign proceeded to paint the delights of the excursion in the brightest colors he could command. They were to go to Cadiz in a boat which he had lately bought; she was a capital sailer—there was a half-deck forward, under which the Major might sleep as com-

fortably as in his own bed—a cooking apparatus (and here, as he expatiated on the grills and stews and devils that were to be cooked and eaten, with the additional stimulus to appetite afforded by sea air, there was a spark of relenting in my grandfather's eye). "You shall return," said the tempter, "with a digestion so completely renovated, that my name shall rise to your tongue at each meal as a grace before meat, and a thanksgiving after it; and as to sea-sickness, why, this Levanter will take us there in twelve hours, so smoothly that you may balance a straw upon your nose the whole way." Finally, the cunning Ensign laid before him an application for leave already made out, and only awaiting his signature.

My grandfather made some feeble objections, which Owen pooh-poohed in his usual off-hand fashion. There was no standing against the youngster's strong will, and at five o'clock that same evening the Major found himself proceeding through the town towards the Waterport for embarkation, by no means fully reconciled to the abandonment of his beloved Lares. My luckless grandfather! did no presentiment warn you of a consequence then hanging in the clouds, that was to change utterly for you the untroubled aspect of those household gods?

Owen had attired himself for the trip in a half-nautical costume—a shirt of light-blue flannel, fastened at the collar with a smart bandana, a blue jacket, loose duck trousers, and a montero cap, which costume became the puppy well enough. He seemed of this opinion himself, as he walked gaily along beside the Major: so did the black-eyed occupants of many houses on each side, who peeped forth smilingly from behind their green lattices, sometimes nodding, and kissing their hands—for the Ensign had an incredible acquaintance with the budding and full-blown portion of the population of Gibraltar. The Major had stuck to his buckskins, (which stuck to him in return), over which he had drawn a pair of jack-boots, and wore his red-laced coat and regimental hat—for in those days that passion for mufti, now so prevalent in the army, did not exist. Whenever he caught sight of any of the greetings bestowed from the windows, he would take off his laced hat, and, fixing his eyes on the tittering señorita, who generally let fall the lattice with a slam, would make her a low bow—and, after each of

these acts of courtesy, my grandfather walked on more elated than before.

They passed the drawbridge at Waterport, and, struggling through the crowd of Turks, Jews, infidels, and heretics, who usually throng the quay, entered a shore-boat that was to row them out to where Owen's vessel—the *Fair Unknown*, as he had christened her, in memory of his unforgotten partner at the Carnival ball—lay moored. In her they found a sailor who was to accompany them on their voyage—a noted contrabandista, called Francisco, whose friendship Owen had lately acquired, and who acted as his lieutenant on his marine excursions. The boat was a neat affair—a small cutter, smartly painted, well found, and capable of holding several persons comfortably; and Francisco was a ruddy, portly, dark-skinned, large-whiskered son of the sea, the picture of good-humor. My grandfather stepped in, in his jack-boots. There was much settling of carpet-bags and stowing of provisions in the lockers, and then they hoisted sail, and glided smoothly out from among the shipping into the bay.

The breeze was light and fair, and they went on, as Frank had promised, pleasantly enough. My grandfather for the first time surveyed the scene of his two years' residence from the sea. The grey old rock looked mellow in the evening light, as an elderly gentleman over his wine—the window-panes glanced ruddily, the walls gleamed whitely, and the trees were tinted with a yellower green; behind, in the eastern sky, floated one single purple cloud. As the objects became confused in the distance, the sharp rugged outline of the rock assumed the appearance that has caused the Spaniards to call it *El Cuerpo*—the appearance of a vast human body laid out on its back, and covered with a winding-sheet, like a dead Titan on his funeral pile—the head towards Spain, the chest arched at Middle Hill, the legs rising gently upward to the knees at O'Hara's Tower, and then sloping down till the feet rest on Europa. The sun went down as they rounded Cabrita Point, and the breeze, freshening, took them swiftly along under the huge hills that rise abruptly upward from the Spanish coast. Then Francisco, lighting a charcoal fire, placed thereon, in a frying-pan, tender steaks thickly strewn with sliced tomatas and onions, from whence arose a steam that brought tears of gratitude and delight into my grandfather's

eyes. He anxiously watched the cooking—even threw out slight suggestions, such as another pinch of pepper, an additional onion, a slight dash of cayenne, and the like; and then, settling a plate firmly on the knees of his jack-boots, with a piece of bread and a cup by his side, and a knife and fork pointing upwards in his hands like lightning-conductors, gazed cheerfully around him. And when Francisco, rising from his knees, where he had been blowing the charcoal fire, removed the hissing pan towards my grandfather's plate, transferring to it a liberal portion of the contents, the good man, gazing on the white and red streaks of vegetable relieved by the brown back-ground of steak, and the whole picture swimming in a juicy atmosphere of gravy, felt sentiments of positive friendship towards that lawless individual, and, filling a bumper of Xerez, drank success to the voyage.

Three times was my grandfather's plate replenished from the thrice-filled pan. Afterwards he dallied a little with a cold pie, followed by a bit of cheese for digestion. Then, folding his hands across his stomach, he expressed his sincere opinion, that he had never tasted any thing so good as that steak; and when Owen placed in his hand a smoking can of grog, he looked on the young man with a truly paternal eye. He talked complacently and benevolently, as men do who have dined well—praised the weather, the boat, the scene—and wondered where a man was going who rode slowly along a mountain-path above them, within hail, following him, in imagination, to his home, in a sort of dreamy contentment. After a second can he began to grow drowsy, and, just aware that Owen said the breeze was still freshening, retired to the soft mattress spread for him under the half-deck, and replacing his cocked-hat by a red nightcap, slept till morning.

It was broad daylight when he woke, conscious that for an hour or two past he had been sleeping most uneasily. There was a violent swinging motion, a rushing of wind and of water, that confused him extremely; and, forgetting where he was, he nearly fractured his skull by rising suddenly into a sitting posture. Steadying himself on his hands, in the posture of the Dying Gladiator, he slewed himself round on the pivot of his stern, and protruded his powdered head, like an old beaver, out of his hole. Owen and

Francisco were sitting in a pool of water, trying to shelter themselves under the weather-side of the boat—dripping wet, and breakfasting on cold potatoes and fragments of meat left from last night's meal. My grandfather did not like the appearance of things at all. Rent in twain by horrible qualms, he inquired feebly of Owen if they were near Cadiz? Frank, in reply, shook his head, and said they were at anchor. Then my grandfather, making a vigorous effort, emerged completely from his place of repose, and, rising to his feet, looked over the gunwale. The scene he beheld was in dreary contrast to that of the evening before. Ridges of white foam were all around—ahead was a long low line of sandy coast, terminating in a point of rock whereon stood a lighthouse; and to leeward the bay was enclosed by steep hills. Over the low coast-line the wind blew with steady violence. A bright sun rather increased the dreariness of the prospect, which was suddenly closed to my grandfather by a shower of spray, that blinded him, and drenched him to the skin, converting his jack-boots into buckets. The wind had increased to a gale during the night, and they had been forced to take precarious shelter in the harbor of Tarifa. The Major did not venture on a second peep, but sat, dismally wet and sea-sick, the whole morning, trying to shelter him as he best could. Once, a man came down to the beach, and gesticulated like a scaremouch, screaming also at the same time; but what his gestures and screams signified nobody on board could tell. At length, as the gale did not moderate, while their position increased in discomfort, and was also becoming precarious (for one of their anchors was gone, and great fears were entertained for the other), Owen and Francisco decided to weigh, and stand in for the shore, trusting to the smuggler's seamanship for a safe run. The Major, in spite of his sickness, stood up and pulled gallantly at the cable, the wind blowing his pigtail and skirts perpendicularly out from his person. "Heaf!" screamed Francisco from the bows; "Heave!" echoed Owen; and as the words flew past him on the gale, my grandfather's exertions were prodigious. At last, after tremendous tugging, the anchor came up. The jib was hoisted with a reef in it, Owen holding the sheet, while the smuggler ran aft and took the helm. They bent over to the gale, till the Major stood almost perpendicularly on

the lee gunwale, with his back against the weather side, and ran in till he thought they were going to bump ashore; then tacking, they stood up along the coast, close to the wind, till Francisco gave the word. Owen let go the sheet, and the jib fluttered loosely out as they ran through a narrow passage into smooth water behind the sea-wall, and made fast to a flight of steps.

Presently some functionary appertaining to the harbor appeared, and with him an emissary from the Governor of the place, who, aware of their plight, had civilly sent to offer assistance. The messenger was the same man who had made signals to them from the beach in the morning; and he seemed to think it advisable that they should wait on the Governor in person, saying that he was always disposed to be civil to British officers. This advice they resolved to act upon at once, before it should grow dark, foreseeing that, in case of their detention from bad weather in Tarifa, the Governor might prove a potent auxiliary. The Major would have wished to make some little alterations in his toilette, after his late disasters; but, after trying in vain to pull off his jack-boots, which clung to him like his skin, he was obliged to abandon the idea, and contented himself with standing on his head to let the water run out of them. As they advanced along the causeway leading to the town (the point where they landed is connected with the town by a long narrow sandy isthmus), the gale swept over them volumes of sand, which, sticking on my grandfather's wet uniform, gave him somewhat the appearance of a brick-wall partially rough-cast. His beard was of two days' growth—his hair-powder was converted into green paste by the sea-water—and his whole appearance was travel-stained and deplorable. Nevertheless his dignity by no means forsook him as they traversed the narrow alleys of the ancient town of Tarifa on their way to the approaching interview.

His excellency Don Pablo Dotto, a wonderfully fat little-man, received them very courteously. He was a Spaniard of the old school, and returned the stately greeting of my grandfather, and the easy one of the Ensign, with such a profusion of bows, that for the space of a minute they saw little more of his person than the shining baldness on the top of his head. They were then presented to his wife, a good-natured, motherly sort of old lady, who

seemed to compassionate them much. But, while Owen was explaining to her the object of their trip and its disastrous interruption, he suddenly stopped, open-mouthed, and blushing violently, with his gaze directed towards the open door of a neighboring apartment. There he beheld advancing towards him, the Beauty of the Carnival ball.

The Governor's lady named her as "her daughter, the Señorita Juana." Spite of the different dress and circumstances, she too recognized Frank, and colored slightly as she came forward to receive his greeting. The Ensign, an impudent scamp enough in general, was, however, the more confused of the two; and his embarrassed salutation was entirely thrown into the shade by the magnificence of my grandfather's bow. However, he presently recovered his assurance, and explained to the elder lady how he had previously enjoyed the pleasure (with a great stress upon the word) of making her daughter's acquaintance. Then he recounted to Juana the manner in which they had been driven in here, when on their way to Cadiz to see the bull-fight.

"We also are going to ride thither to-morrow," said the Señorita, softly.

"Ah, then, we shall meet there," said Frank, who presently after was seized with a fit of absence, and made incoherent replies. He was considering how they might travel together, and had almost resolved to offer to take the whole family to Cadiz in his boat—a proposal that would probably have somewhat astonished the little Governor, especially if he had seen the dimensions of the craft thus destined to accommodate himself and retinue. But Garry was an adept at manœuvring, and marched skilfully upon the point he had in view. He drew such a pathetic picture of the hardships they had endured on the voyage—their probable detention here for most of their short leave—their friendless condition, and their desire to see something of the country—that the little Governor was in a manner impelled (fancying all the time that the impulse sprang altogether from his own native benevolence) to desire the two forlorn Englishmen would travel to Cadiz under his escort. So it being settled entirely to Garry's satisfaction that they were to start next morning at break of day on horseback—an arrangement which my grandfather's total ignorance of Spanish prevented him from knowing anything about

they retired to the principal fonda, where the Major speedily forgot, over a tolerable dinner, the toils and perils of the voyage.

CHAPTER II.

DAYBREAK the next morning found them issuing forth from the ancient city of Tarifa on a couple of respectable-looking hacks, hired from the innkeeper. Frank had, with his accustomed generalship, managed to secure a position at the off-rein of the Señorita Juana, who was mounted on a beautiful little white barb. Under her side-saddle, of green velvet studded with gilt nails, was a Moorish saddle-cloth, striped with vivid red and white, and fringed deeply. From the throat-lash of the bridle hung a long tassel, as an artificial auxiliary to the barb's tail in the task of keeping the flies off, further assisted by a tuft of white horse-hair attached to the butt of her whip. She wore a looped hat and white plume, a riding-skirt, and an embroidered jacket of blue cloth, fastened, as was the wrought bosom of her chemise, with small gold buttons. Frank could not keep his eyes off her, now riding off to the further side of the road to take in at once the whole of the beautiful vision, now coming close up to study it in its delightful details.

In front of the pair rode the little Governor, side by side with a Spaniard of about thirty, the long betrothed lover of Juana—so long, in fact, that he did not trouble himself to secure his authority in a territory so undeniably his own, but smoked his cigar as coolly as if there were no good-looking Englishman within fifty miles of his mistress. He wore garments of a Spanish cut, made of nankeen—the jacket frogged with silver cords, tagged with little silver fishes—the latter appended, perhaps, as suitable companions to the frogs. A hundred yards ahead was an escort of four horse-soldiers with carbines on their thighs, their steel accoutrements flashing ruddily in the level sunlight. Behind Frank came Major Flinders, clean shaved, and with jack-boots and regimental coat restored to something like their pristine splendor: by his side rode another lady, the Señorita Carlota, Juana's aunt, somewhere about thirty years old, plump and merry, her upper lip fringed at the corners with a line of dark down, quite decided enough for a cornet of eighteen to be proud of—a feminine embellishment too common for remark in these southern regions, and in the opinion of some

connoisseurs, rather enhancing the beauty of the fair wearers. She talked incessantly, at first, to my grandfather, who did not understand a word she said, but whose native politeness prompted him to say, "Si, Señorita," to everything—sometimes laying at the same moment his hand on his heart, and bowing with considerable grace. Behind this pair came another interesting couple—viz. two servants on mules, with great saddle-bags stuffed to extreme corpulence with provisions.

It was a glorious morning—a gentle breeze sweeping on their faces as they mounted the hills, but dying into silence in the deep valleys, fresh, and glistening with dew. Sometimes they rode along a rocky common, yellowed with a flowering shrub like furze—sometimes through unfenced fields—sometimes along broad plains, where patches of blossoming beans make the air rich with scent, and along which they galloped full speed, the Governor standing high in the stirrups of his demi-pique, the Señorita's white barb arching his neck till his muzzle touched his chest under the pressure of the long bit, and my grandfather prancing somewhat uneasily on his hard-mouthed Spanish entero, whose nose was, for the most part, projected horizontally in the air. The Major was not a first-rate seat—he rode with a long stirrup, his heel well down, his leg straight, and slanting a little forward, body upright, and elbows back, as may be seen in the plates to ancient works on equitation—a posture imposing enough, but not safe across country: galloping deranged it materially, for the steed was hard-mouthed, and required a long, strong pull, with the body back, and a good purchase on the stirrups. The animal had a most voracious appetite, quite overcoming his sense of what was due to his rider; and, on seeing a tuft of juicy grass, down went his nose, drawing my grandfather, by means of the tight reins, well over the pommel. On these occasions, the Major, feeling resistance to be in vain, would sit looking easily about him, feigning to be absorbed in admiration of the prospect—which was all very well, where there was a prospect to look at, but wore a less plausible appearance when the animal paused in a hollow between two hedges, or ran his nose into a barn-door. But whenever this happened, Carlota, instead of half-smothering a laugh, as a mischievous English girl would, ten to one, have done, sat

most patiently till the Major and his steed came to an understanding, and would greet him, as they moved on again, with a good-natured smile, that won her, each time, a higher place in his estimation.

Thus they proceeded till the sun rose high in the heavens, when, on reaching a grove on the edge of one of the plains, they halted under a huge cork-tree, near which ran a rivulet. The cavalcade dismounted—the horses were tethered, the mules disburthened of the saddle-bags, and the contents displayed under the tree; horse-cloths and cloaks were spread around on the ground, and a fire of dry sticks was lit on the edge of the stream with such marvellous celerity that, before my grandfather had time to take more than a hasty survey of the catables, after seating himself on the root of a tree, a cup of steaming chocolate was placed in his hand.

"Confess, Major," said Garry, speaking with his mouth full of sausage, "that a man may lose some of the pleasures of existence by leading the life of a hermit. Don't you feel grateful to me for dragging you out of your cobweb to such a pleasant place as this?"

"Tis an excellent breakfast," said my grandfather, who had just assisted the Señorita Carlota to a slice of turkey's breast, and himself to an entire leg and thigh—dividing with her, at the same time, a crisp white loaf, having a handle like a teapot or smoothing-iron—"and my appetite is really very good. I should be perfectly easy if I could only understand the remarks of this very agreeable lady, and make suitable replies."

"Let me interpret your sentiments," said Garry; "and though I may not succeed in conveying them in their original force and poetry, yet they shall lose as little as possible in transmission. Just try me—what would you wish to say?"

"Why, really," said my grandfather, pondering, "I had a great many things to say as we came along, but they've gone out of my head. Do you think she ever read Shakspeare?"

"Not a chance of it," said Owen.

Here the Señorita laughingly appealed to Frank to know what my grandfather was saying about her.

"Ah," quoth my grandfather, quoting his friend Shakspeare—

"I understand thy looks—the pretty Spanish
Which thou pourest down from these swelling heavens
I am not perfect in—,"

She's an extremely agreeable woman, Frank, I'll be sworn, if one only understood her," quoth my grandfather, casting on her a glance full of gallantry.

The Ensign was not so entirely occupied in prosecuting his own love affair as to be insensible to the facilities afforded him for amusing himself at the Major's expense. Accordingly, he made a speech in Spanish to Carlota, purporting to be a faithful translation of my grandfather's, but teeming, in fact, with the most romantic expressions of chivalrous admiration, as was apparent from the frequent recurrence of the words "ojos" (eyes), "corazon" (heart), and the like amatory currency.

"There, Major," said the interpreter, as he finished; "I've told her what you said of her."

The Major endorsed the compliments by laying his hand upon his heart, and bowing with a tender air. Whereupon Carlota, laughing, and blushing a deeper red, made her acknowledgments.

"She says," quoth Frank, "that she knew the English before to be a gallant nation; but that if all the caballeros (that's gentlemen) of that favored race are equal to the present specimen, her own countrymen must be thrown entirely into the shade."

"Delightful!" cried my grandfather; but it is doubtful whether this expression of pleasure was called forth by the sentiments attributed to the Señorita, or by the crisp succulent tenderness of a mouthful of sucking pig which was at that moment spreading itself over his palate.

Following up his idea, the mischievous Ensign continued to diversify the graver pursuit of prosecuting his own suit with Juana, by impressing Carlota and the Major with the idea that each was disposed to think favorably of the other. In this he was tolerably successful—the speeches he made to Carlota, supposed to originate with my grandfather, had a very genuine warmth about them, being, in fact, very often identical with those he had just been making, under immediate inspiration, to his own divinity; while as for the Major, it would have been an insult to the simplicity of that worthy man's nature to

exert any great ingenuity in deceiving him; it would have been like setting a trap for a snail. So they journeyed on, highly pleased with each other, and occasionally, in the absence of their faithful interpreter, conversed by means of smiles and courteous gesticulations, till my grandfather felt entirely at his ease, and was almost sorry when, on the evening of the second day, they got to Cadiz.

CHAPTER III.

A WHOLE city full of people condensed into one broad amphitheatre, all bearing a national resemblance to each other in countenance and costume, all apparently animated by the same spirit—for nothing could be more unanimous than the applause which greeted a favorite smilingly crossing the arena, the abuse which overwhelmed an object offensive to the eye of the many-headed, or the ridicule which descended in a joyous uproarious flood on the hapless individual in whose appearance, dress, or manner, any thing was detected calculated to appeal to the highly sensitive risible faculty of a Spanish assembly;—a gay and picturesque mixture of colors, waving and tossing like a garden in a breeze, as the masses of white mantillas, heads black as coal, decorated with flowers and green leaves, red sashes, tufted sombreros, and yellow gaiters, with here and there a blue-and-white soldier standing stiffly up, were agitated by each new emotion—such was the scene that met the eyes of our travellers on entering the bull-ring at Cadiz before the sport commenced.

My grandfather had made his entry in spectacles—appendages highly provocative of the public mirth—and had looked wonderingly for a minute or two through the obnoxious glasses on a sea of faces upturned, sideturned, and downturned, all looking at him, and all shouting some indistinguishable chorus; while the men beat time, each with the long, forked, painted stick, without which no Spaniard possessing sentiments of propriety ever comes to a bull-fight, in a manner most embarrassing to a somewhat bashful stranger, till their attention was luckily diverted to an unhappy man in a white hat, in derision of whom they immediately sang a song, the burden of which was “*El del sombrero blanco*,” (he of the white hat,) the multitude conducting itself throughout like one man.

My grandfather and his friends occupied a

distinguished position in a box high above the multitude, and near that of the *alcalde*. The *Señorita Juana* looked more lovely than ever in a white dress, over which flowed a white gauzy mantilla, giving a kind of misty indistinctiveness to the wavy outlines of her figure, and the warm tint of her neck and arms. From her masses of black hair peeped one spot of vivid white, a rosebud; and a green plummy leaf, a favorite ornament with Spanish girls, drooped, bending, and soft as a feather, on one side of her gold-and-tortoiseshell comb. The Major sat beside *Carlota*, who, naturally frank, and looking upon him now as an old acquaintance, would tap his arm most bewitchingly with her fan when she wanted to direct his attention to any object of interest. So the Major sat by her, all gallantry and smiles, gazing about him with wonder through the double gold eyeglass, which still, in spite of the late expression of popular feeling, bestrid his nose. He looked with the interest of a child at every thing—at the faces and dresses around him, distinct in their proximity, and at those, confused in their details by distance, on the opposite side of the arena. He shared in the distress of an unfortunate person (contractor for bulls, who had palmed some bad ones on the public) who tried, as he walked conspicuously across the ring, to smile off a torrent of popular execration about as successfully as a lady might attempt to ward off Niagara with her parasol, and who was, as it were, washed out at an opposite door, drenched and sodden with jeers. And when the folding gates were opened, and the gay procession entered, my grandfather gazed on it with delight, and shouted “*Bravo!*” as enthusiastically as if he had been an habitual frequenter of bull-rings from his earliest youth. First came the *espadas* or *matadores*, their hair clubbed behind like a woman’s, dressed in bright-colored jackets, and breeches seamed with broad silver lace, white stockings, shoes fastened with immense rosettes, and having their waists girt with silk sashes, bearing on their arms the blood-colored cloaks that were to lure the bull upon the sword-point. Next followed the *chulos*, similarly attired; then the *picadores*, riding stiffly, with padded legs, on their doomed steeds; and mules, whose office it was to drag off the dead bulls and horses, harnessed three abreast as in classic chariots, and almost hidden under a mass of

gay housings, closed the procession. Marching across the middle of the ring to the alcalde's box, they requested permission to begin, and, it being granted, the picadores stationed themselves at equal distances from each other round the circumference of the arena. Then, at a signal from the alcalde two trumpeters in scarlet, behind him, stood up and sounded—a man, standing with his hand ready on a bolt in a door underneath, drew it, and pulled the door swiftly back, shutting himself into a niche, as the dark space thus opened was filled by the formidable figure of a bull, who, with glancing horns and tail erect, bounded out, and, looking around during one fierce brief pause, made straight at the first picador. The cavalier, standing straight in his stirrups, his lance tucked firmly under his arm, fixed the point fairly in the shoulder of the brute, who, never pausing for that, straightway upset man and horse. Then my grandfather might be seen stretching far over the front of his box, his eyes staring on the prostrate picador, and his hands clenched above his head, while he shouted, "By the Lord, sir, he'll be killed!" And when a chulo, darting alongside, waved his cloak before the bull's eyes and lured him away, the Major, drawing a long breath, turned to a calm Spaniard beside him, and said, "By heaven, sir, 'twas the mercy of Providence!"—but the Spaniard, taking his cigar from his mouth, and expelling the smoke through his nostrils, merely said, "Bien está" ('tis very well.) Meanwhile, the bull (who, like his predecessor in the china-shop, seemed to have it all his own way) had run his horns into the heart of a second horse, and the picador, perceiving from the shivering of the wounded creature that the hurt was mortal, dismounted in all haste, while the horse, giving one long, blundering stagger, fell over and died, and was immediately stript of his accoutrements. This my grandfather didn't like at all; but, seeing no kindred disgust in the faces round him, he nerved himself, considering that it was a soldier's business to look on wounds and death. He even beheld, with tolerable firmness, the spectacle of a horse dashing blindfold and riderless, and mad with fear and pain, against the barrier—rebounding whence to the earth with a broken shoulder, it was forced again on its three legs, and led stumbling from the ring. But when he saw another horse raised to its feet, and, all ript

open as it was, spurred to a second assault, the Major, who hadn't the heart himself to hurt a fly, could stand it no longer, but, feeling unwell, retired precipitately from the scene. On reaching the door, he wrote over the same, with a bit of chalk, part of the speech of Henry V., "the royal imp of fame," to his soldiers at Agincourt:—

"He that hath not stomach for the fight,
Let him depart—"

to the great astonishment of the two Spanish sentries, who gazed on the words as if they contained a magical spell.

Frank sat till it was over—"played out the play." Not that he saw much of the fight, however; he had eyes and speech for nothing but Juana, and was able to indulge his *penchant* without interruption, as the little Governor took great interest in the fight, and the lover with the silver fishes was a connoisseur in the sport, and laid bets on the number of horses that each particular bull would kill with great accuracy. So the Ensign had it all his own way, and, being by no means the sort of person to throw away this or any other opportunity with which fortune might favor him, got on quite as well, probably, as you or I might have done in his place.

Leaving Cadiz next morning, they resumed the order of march they had adopted in coming—Don Pablo riding, as before, in front with the knight of the silver fishes, discussing with him the incidents of the bull-ring. The old gentleman, though very courteous when addressing the two Englishmen, had but little to say to them—neither did he trouble himself to talk much to the ladies: and when he did, a sharp expression would sometimes slip out, convincing Owen that he was something of a domestic tyrant in private—a character by no means inconsistent with the blandest demeanor in public. The Ensign was at great pains to encourage the Major to be gracious to Carlota. "Get a little more tropical in your looks, Major," he would say; "these Spanish ladies are not accustomed to frigid glances. She's desperately in love with you—pity she can't express what she feels; and she mightn't like to trust an interpreter with her sentiments."

"Pooh, nonsense, boy," said the Major, coloring with pleasure, "she doesn't care for an old fellow like me."

"Doesn't she?—see what her eyes say—that's what I call ocular demonstration,"

quoth the Ensign. "If you don't return it you're a stock, a stone." Then he would say something to Carlota, causing her eyes to sparkle, and canter on to rejoin Juana.

It was genial summer-time with Carlota—she had passed the age of maiden diffidence, without having attained that of soured and faded spinsterhood. She had a sort of jovial confidence in herself, and an easy demeanor towards the male sex, such as is seen in widows. These supposed advances of the Major were accordingly met by her rather more than half-way. None but the Major was permitted to assist her into the saddle, or to receive her plump form descending from it. None but the Major was beckoned to her rein when the path was broken and perilous, or caught on his protecting arm the pressure of her outstretched hand, when her steed stumbled over the loose pebbles. None was repaid for a slight courtesy by so many warm, confiding smiles as he. These, following fast one on another, began to penetrate the rusty casing of the Major's heart. On his own ground—that is, in his own quarters—he could have given battle, successfully, to a score of such insidious enemies: his books, his flowers, his pipe, his slippers, and a hundred other Penates would have encircled him; but here, with all his strong palisading of habit torn up and scattered, all his wonted trains of ideas upset and routed by the novelty of situation and scenery, he lay totally defenceless, and open to attack. The circumstance of himself and Carlota being ignorant of each other's language, far from being an obstacle to their mutual good-will, rather favored its progress. In company with an Englishwoman, in similar circumstances, my grandfather would have considered himself bound to entertain her with his conversation, and, perhaps, have spoiled all by trying to make himself agreeable—it would have been a tax on the patience of both: but being absolved from any such duty in the present instance, he could without awkwardness ride onward in full and silent communion with his own thoughts, and enjoy the pleasure of being smiled upon without being at any pains to earn it.

His note-book, containing an account of the expedition, which I have seen—and whence, indeed, the greater part of this chronicle is gathered—exhibits, at this period of the journey, sufficient proof that the Major enjoyed this new state of being extremely, and felt his

intellect, his heart, and his stomach all stimulated at once.

"Spain," says my grandfather, in a compendious descriptive sentence, "is a country of garlicky odors, of dirty contentment, of overburthened donkeys, and of excellent pork; but a fine air in the hills, and the country much sweeter than the towns. The people don't seem to know what comfort is, or cleanliness, but are nevertheless very contented in their ignorance. My saddle is bad, I think, for I dismounted very sore to-day. The Señorita mighty pleasant and gracious. I entertain a great regard for her—no doubt a sensible woman, as well as a handsome. A pig to-day at breakfast, the best I have tasted in Spain."

The desultory style of the composition of these notes prevents me from quoting largely from them. Statistics, incidents of travel, philosophic reflections, and the state of his digestive organs, are all chronicled indiscriminately. But, from the above mixture of sentiments, it will be perceived that the Major's admiration for Carlota was of a sober nature, by no means ardent or Quixotic, and pretty much on a par with his passion for pig.

This was far from being the case with Garry, who became more and more enamoured every hour. The Spanish lover continued to conduct himself as if he had been married to Juana for twenty years, never troubling himself to be particularly agreeable or attentive, for which obliging conduct Garry felt very grateful to him. The Major had been too long accustomed to witness Owen's philanderings to see any thing peculiar in the present case, till his attention was attracted by a little incident he accidentally witnessed. After the last halt they made before reaching Tarifa, Garry was, as usual, at hand, to assist Juana to her saddle. Her horse was fastened in a thicket of oleanders, whose flowers and leaves formed a screen such as Cupid himself might have planted. Garry seized the charming opportunity to offer to re-tie the ribbons of her hat, which was very considerate; for, to tie them herself, she would have been obliged to take off her gloves, which would have been a great trouble. Having done so, still retaining his hold of the strings, he glanced quickly around, and then drew her blooming face towards his own till their lips met—for which piece of impudence he only suffered the slight penalty of a gentle tap with her whip. My

grandfather discreetly and modestly withdrew his eyes, but he was not the only observer. He of the silver fishes was regarding them with a fixed look from among some neighboring trees, where he had tethered his horse. Probably the Spaniard, with all his indifference, thought this was carrying matters a little too far, for, after conversing a moment with the Governor, he took his place at Juana's side, and did not again quit it till they arrived at Tarifa. Then both he and the Governor took leave of our travellers with a cold civility, defying all Garry's attempts to thaw it, and seeming to forbid all prospect of a speedy renewal of the acquaintance.

CHAPTER IV.

At the inn, that night, the Major betook himself to rest early, that he might be ready to start for Gibraltar betimes in the morning, for on the following day their leave was to expire.

He had slept soundly for several hours, when he was awoke by Owen, who entered with a candle in his hand. The Major sat up in bed and rubbed his eyes.

"Time's up, my boy, eh?" said he, with a cavernous yawn. "I should have liked another hour of it, but it can't be helped," (preparing to turn out).

"I didn't want to spoil your rest last night," said Owen, seating himself on the edge of the bed, "so I said nothing about a mishap that has occurred. That smuggling villain, Francisco, took advantage of our absence to fetch a contraband cargo in the boat from Gibraltar, and has been caught in attempting to run it here."

"God bless me," said my grandfather, "who would have thought it!—and he such a capital cook! But what's to be done? where's the boat?"

"The boat is, for the present, confiscated," said Garry; "but I dare say the Governor would let us have it in the morning, on explaining, and would perhaps release Francisco, with the loss of his cargo; but—but—in fact, Major, I don't want the Governor to know anything about our departure."

My grandfather stared at him, awaiting further explanation.

"Juana looked pale last night," said the Ensign after a pause.

The Major did not dispute the fact, though he could not, for the life of him, see what the

state of Juana's complexion had to do with the subject.

"She never liked that dingy Spanish lover of hers," said the Ensign, "and her father intends she shall marry him in a month. 'Twould make her miserable for life."

"Dear me," said my grandfather, "how do you know that?"

"She told me so. You see," said Owen, shading the candle with his hand, so that my grandfather could not see his face, and speaking hurriedly, "I didn't intend we should start alone—in fact—that is—Juana has agreed to fly with me to Gibraltar."

"Agreed!—fly!"—gasped my grandsire: "what an extraordinary young fellow!"

"She's waiting for us now," resumed Garry, gathering courage after the first plunge into the subject; "we ought to be off before daylight. Oblige me, my dear sir" (smiling irresistibly), "by getting up immediately."

"And how are we to get away," asked my grandfather, "supposing this insane scheme of yours to be attempted?"

"I've bribed the sentry at Francisco's place of durance," returned the Ensign. "We shall get out of the town the instant the gates are opened; and the boat is tied to the steps, as before, only under the charge of a sentry whom we can easily evade. Every guarda costa in the place was sent out last night to blockade a noted smuggler who has taken refuge in Tangier; so, once out, we are safe from pursuit: I found it all out after you had gone to bed."

The disposition of Major Flinders, as the reader knows, was the reverse of enterprising—he wouldn't have given a straw to be concerned in the finest adventure that ever happened in romance. He paused with one stocking on, inclined, like the little woman whose garments had been curtailed by the licentious shears of the pedlar, to doubt his own identity, and wondering if it could be really he, John Flinders, to whom such a proposition was broached, requiring him to assist in invading the peace of a family. As soon as he recovered his powers of speech, of which astonishment had for a moment deprived him, he began earnestly to dissuade the Ensign from the enterprise; but Owen knew his man too well, and had too much youthful vivacity of will to allow much time for remonstrance.

"Look you, Major," said he, "I'm positive I can't live without Juana. I'll make a bold stroke for a wife. The thing's settled—no go-

ing back now for me; and I shall go through with it with or without you. But you're not the man, I'm sure, to desert a fellow in extremity, at a time, too, when the advantages of your experience and coolness are so peculiarly needed. 'Call you that backing of your friends?' "

The compliment, or the quotation, or both, softened the Major. "'Would it were night, Hal, and all well,'" said he, half mechanically following the Falstaffian train of ideas Owen had artfully conjured up, and at the same time drawing on the breeches which that astute youth obsequiously handed to him.

It was still dark when they issued forth into the narrow and dingy streets of Tarifa. My grandfather, totally unaccustomed to visit the glimpses of the moon in this adventurous fashion, was full of strange fears—heard as many imaginary suspicious noises and voices as Bunyan's Pilgrim in the dark valley—and once or twice stopped abruptly and grasped Owen's arm, while he pointed to a spy dogging them in the distant gloom, who turned out to be a door-post. But Owen was now in his element; no tom-cat in Tarifa was more familiar with housetops and balconies at the witching hour than he, and he stepped gaily on. Presently they were challenged by a sentry, to whom Owen promptly advanced and slipped into his itching palm a doubloon, when the trustworthy warrior immediately turned upon his heel, and, walking to the extremity of his post, looked with great vigilance in the opposite direction.

Owen advanced to a grated window and tapped. Immediately the burly face of Francisco showed itself thereat, his white teeth glancing merrily in a glimmer of moonshine. A bar, previously filed through, was removed from the window, and Owen taking him by the collar to assist his egress, drew him through as far as the third button of his waistcoat, where he stuck for a moment; but the substance was elastic, and a lusty tug landed him in the middle of the narrow street. Receiving Frank's instructions given in a hurried whisper, to go at once to where the boat lay, and cast her off, ready to shove off on the instant, he nodded and disappeared in the darkness, while Owen and the Major made for the Governor's house.

Arrived near it, Owen gave a low whistle—a peculiar one, that my grandfather remembered to have heard him practising to Juana on the previous day—when, to the unuttera-

ble surprise of the Major, two veiled figures appeared on the balcony.

"Why, Owen, boy, d'ye see!" quoth the Major, stuttering with anxiety, "who can the other be?—her maid, eh?"—indistinct stage recollections of intriguing waiting-women dawning on him.

"Ahem!—why, you see, Major," whispered Owen, "she wouldn't come alone—couldn't manage it at all, in fact, without the knowledge of her aunt, who sleeps in the next room; so I persuaded Carlota to come too, and gave her a sort of half promise that you would take care of her." Here, wishing to cut short a rather awkward explanation, he ran under the balcony—one of the ladies dropped a cord—and Owen producing from under his coat a rope ladder, (he had sat up all night making it), attached it, and, as soon as it was drawn up, ascended, motioning to my astounded grandfather to keep it steady below. The Major, after a moment's desperate half-resolve to make a hasty retreat from the perilous incidents which seemed momentarily to thicken round him, and leave his reckless friend to his fate, yielded to the force of circumstances, and did what was required of him. Then Owen lifted the ladies, one after the other, over the railing of the balcony, and they swiftly descended. First came Juana, who, scarcely touching the Major's offered hand, lit on the pavement like gossamer; then Carlota descended, and making, in her trepidation, a false step near the bottom came so heavily on the Major, that they rolled together on the stones. By the time they were on their feet again, Owen had slipped down the ladder, and, taking Juana under his arm, set off rapidly towards the bay.

If any thing could have added to the Major's discomfiture and embarrassment, it would have been the pressure of Carlota's arm on his, as she hung confidently on him—a pressure not proceeding from her weight only, but active, and with a meaning in it; but he was in that state of mental numbness from the successive shocks of astonishment, that, as with a soldier after the first two dozen, any additional laceration passed unheeded. He was embarked on an adventure of which he could by no means see the end; all was strange and dark in the foreground of his future; and if he had been at that moment tried, cast, and condemned for an im-

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aginary crime, he would have been too apathetic to say any thing in arrest of judgment.

With the silence and swiftness of a forlorn hope, they passed through the town and along the sandy causeway. The succession of white rolling waves on their left, where extended the full breadth of the Straits, while the bay on their right was almost smooth, showed the wind to be still against them; but it was now so moderate that they might safely beat up for the Rock. Arrived at the head of the stairs leading to the water, they paused in the angle of the wall to reconnoitre. Francisco was lying coiled up in the head of the boat, his hand on the rope, ready to cast her loose, and the boat-hook projecting over the bow. Above them, and behind the wall, at a little distance, they could hear the measured tread of the sentry, and catch the gleam of his bayonet as he turned upon his walk: a few vigorous shoves would carry them outside the sea-wall and beyond his ken. All depended on their silence; and like two stealthy cats did Owen and Juana descend to the boat—the Major and Carlota watching the success of their attempt with protruded necks. Cautiously did Owen stride from the last stair to the deck—cautiously did he transfer Juana to the bark, and guide her aft. The Major was just preparing to follow, when a noise from the boat startled him: Juana had upset an unlucky wine-jar which Francisco had left there. The sentry put his head over the wall, and challenged; Francisco, starting up, shoved hastily off; the sentry fired his piece, his bullet shattering the wine-jar that had caused the mischief. Juana screamed, Owen swore in English, and Francisco surpassed him in Spanish. There was no time to return or wait for the other pair, for the guard was alarmed by the sentry's shot, and their accoutrements might be heard rattling near at hand, as they turned hastily out. Before they reached the wall, however, the boat had disappeared.

Major Flinders watched it till it was out of sight, and, at first, experienced a feeling of despair at being thus deprived of the aid of Garry's boldness and promptitude, and left to his own resources. Presently, however, a gleam of comfort dawned upon him—perhaps Carlota would now abandon the enterprise, and he should thus, at any rate, be freed from the embarrassment her presence

occasioned him. In this hope he was shortly undeceived. To have added the shame of failure and exposure to her present disappointment, while an opening to persevere still remained, did not suit that lady's ardent spirit; and whether it was that the unscrupulous Garry had really represented the Major as very much in love, or whether such an impression resulted from her own lively imagination, she certainly thought her companion would be as much chagrined at such a denouement as herself. She displayed a prompt decision in this emergency, being, indeed, as remarkable for presence as the Major was for absence of mind. Taking the Major's arm, she caused him swiftly to retrace his steps with her to the inn where he had slept. As they retreated, they heard the boom of a gun behind them, fired, doubtless, from the Point, at the Fair Unknown. At Carlota's orders, a couple of horses one with a side-saddle, were speedily at the inn-door; they mounted, and, before the sun was yet risen, had issued forth from the gate of Tarifa, on the road to Gibraltar.

The Major rode beside her like a man in a dream—in fact, he was partly asleep, having been deprived of a large portion of his natural and accustomed rest, and partly bewildered. A few days before he had been the most methodical, unromantic, not to say humdrum, old bachelor in his Majesty's service; and here he was, how or why he did not well know, galloping away at daybreak with a foreign lady, of whose existence he had been ignorant a week before, with the prospect of being apprehended by her relatives for her abduction, and incarcerated by the Government for assisting in the escape of a smuggler. When at length roused to complete consciousness by the rapidity of their motion, he positively groaned in anguish of spirit, and vowed internally that, once within the shelter of his own quiet quarters, nothing on earth should again tempt him forth on such harum-scarum expeditions.

It was near noon when they reached Algeciras, where they stopped to breakfast, both of them rather exhausted with fatigue and hunger. This town stands just opposite Gibraltar, across the bay—the road they had come by forms the base of a triangle, of which Cabrita Point is the apex, the bay washing one side of the projecting coast, the Straits the other. The Major was reserved and em-

barrassed; there was a tenderness about Carlota's manner that frightened him out of his usual gallantry, and, to avoid meeting her glance, he looked steadily out of the window at the rock of Gibraltar, casting wistful glances at the spot where his quarters lay hidden in a little clump of foliage. Immediately after the meal he quitted the room, on pretence of looking after the horses. He determined to protract their stay in Algeciras till late in the afternoon, that they might enter Gibraltar in the dusk, and thus avoid awkward meetings with equestrian parties from the garrison, who would then be hastening homewards, in order to be in before gun-fire, when the gates are shut.

On returning, still out of temper, to the room where he had left Carlota, he found her, quite overcome with fatigue, asleep on the sofa. Her head was thrown a little back on the cushion; her lips were just parted, and she looked in her sleep like a weary child. The Major approached on tiptoe, and stood regarding her. His ill-humor melted fast into pity. He thought of all her kindness to him, and, by a sudden soft-hearted impulse, took gently one of her hands projecting over the side of the sofa. Carlota opened her eyes, and squeezed the hand that held hers; whereupon the Major suddenly quitted his hold, and, retreating with great discomposure to the window, did not venture to look at her again till it was time to resume their journey.

At a little distance from Algeciras is the river Palmones, called by the English the Second River. This was crossed by a floating bridge, pulled from shore to shore by a ferryman warping on a rope extended across. They had just reached the opposite bank of the stream, when Carlota noticed two horsemen galloping fast along the road they had just traversed. A second glance showed them to be Don Pablo and the lover of Juana. The first inquiries of the Governor had led him to suppose that all had escaped in the boat, and it was not till some time after that he had learned the true state of affairs.

The fugitives now hastened on in earnest, and roused their horses to a steady gallop, never pausing till they reached the Guadarranque, or First River, about a mile nearer Gibraltar than the other, and furnished with a similar bridge. The delay of the pursuers at the former ferry had thrown them far in rear; and my grandfather, inspired by the

imminence of the peril, now conceived a bright idea—the brightest, probably, that ever flashed upon him—by executing which they might effectually distance their pursuers. Dropping his glove at a little distance from the shore, he sent the ferryman to fetch it, and then pushed off (Carlota having already embarked), and warped the bridge to the opposite bank, heedless of the frantic gesticulations of the proprietor, who screamed furiously after them to stop. When he reached the opposite side, he took out his pocket-knife and deliberately cut the rope. Having thus, as it were, blown up the communication in his rear, my grandfather, without the loss of his baggage, continued his retreat to the fortress; while the little Governor, who galloped up just as they were disappearing, was, like Lord Ullin, left lamenting.

The sun was already declining, and threw their shadows far before them on the sands, as they rode along the beach close to the water. The bay at this inner extremity makes a great circular sweep—radii drawn from the rock to different distant points of the arc would be almost equal; and for half an hour they continued to see Gibraltar at nearly the same distance to the right and in front of them, holding itself aloof most provokingly. Twilight descended as they passed the Spanish lines and entered on the Neutral Ground. The Major glanced anxiously at his watch—in a few minutes the gun from Middle Hill would give the signal for shutting the gates and doom them irretrievably to return into Spain for the night. For the first time in his life Major Flinders really punished his horse, lifting the tired beast along with whip and rein. Carlota's kept easily beside him under her lighter weight, and they rapidly neared the barrier. Just as they passed it, a stream of flame shot from the rock, illumining objects like a flash of lightning;—then came the heavy report of the gun—another minute and the drawbridge at Landport would be lifted; but they were upon it. They dashed across somewhat in the style of Marmion quitting Douglas's castle, "just as it trembled on the rise," and were safe in Gibraltar.

CHAPTER V.

AFTER life's fitful fever, the Major did not sleep well. He had left Carlota comfortably established at the inn; and he now lay nervously thinking how his embarrassment with

regard to her was to terminate, especially if Owen did not shortly make his appearance. Then he was worried by doubts as to the fate of the Fair Unknown and her passengers. They might have been recaptured, as escaped smugglers, by a guarda costa—they might be detained in the Straits by adverse winds or calms—they might have run ashore into some bay, and come on overland. This last supposition haunted him most pertinaciously, and he resolved to go up the rock as soon as it should be daylight, to look out for them along the road from Spain. He lay tossing restlessly till the morning gun gave the signal of the approach of dawn, and before the echoes died away he had his breeches on.

Night was at odds with morning when my grandfather, with a telescope under his arm, sallied forth and began the ascent. Silence was over the rock, except an occasional sighing of a remnant of night wind that had lost itself among the crags. At first, the only clear outline visible was that of the rugged edge of the rock above against the colorless sky; but as he toiled up the steep zigzag path, the day kept pace with him—each moment threw a broader light on the scene—blots of shadow became bushes or deep fissures, and new shapes of stone glided into view. The only symptoms of animal life that he beheld were a rabbit that fled silently to his hole, and a great white vulture that, startled from his perch on a grey crag, sailed slowly upward on his black-tipped wings, circling higher and higher, till his breast was crimsoned by the yet unrisen sun.

The path led diagonally to the summit; and, turning a sharp level corner, my grandfather looked perpendicularly down on the Mediterranean, whose lazy waves, sending up a gentle murmur, rippled far below him. On his left, also steep down below him, was the Neutral Ground, level as the sea itself, extending northward into sandy plains, abruptly crossed by tumbled heaps of brown mountains. A reddening of the sky showed that the sun was at hand; and presently the glowing disk came swiftly up from behind the eastern hills; the pale earth shared in the ruddiness of the sky, and a long rosy gleam swept gradually over the breadth of the grey sea, like an unwilling smile spreading itself from a man's lips to his eyes and forehead.

Conspicuous on the highest point in the

landscape stood my grandfather, panting with his exertions as he wiped his forehead. After standing for a moment, bronzed in front like a smith at the furnace, face to face with the sun, he turned and swept with his telescope the road into Spain. Early peasants, microscopic as ants, were bringing their fruits and vegetables into the fortress—a laden mule or two advanced along the beach over which the Major had last night galloped—but nothing resembling what he sought was in sight. Then turning completely round, with his face to the path he had just ascended, he gave a long look towards the Straits; and as he did so, the wind, which had shifted to the southwest towards morning, blew gently on his face. A sail or two was discernable in the distance, outward bound, but nothing resembling the cutter. As the Major looked a signal was made from Cabrita, and directly two feluccas left their station at Algeciras, and swooped out, like two white birds, as if to intercept some bark yet hidden by the Point. Again my grandfather looked out to the Strait, and presently a small white sail came in sight near Cabrita. For a quarter of an hour he stood steadily, with levelled telescope, and then he was almost sure—yes, he could swear—that he saw the small English ensign relieved against the sail; and above, at the masthead, the yellow-striped flag that Francisco hoisted before as the mark of a yacht. It was the Fair Unknown—and my grandfather at once comprehended that the pursuers, whom he had escaped the night before, had, on returning to Algeciras, made arrangements for her capture as soon as she should appear.

The breeze was on her beam, and much fresher with her than farther in the bay, so that the feluccas steered slantingly across her course as she made for the rock. They held on thus, the pursuers and the pursued, till within a mile of each other, when the cutter suddenly altered her course to one nearly parallel with that of the feluccas. The latter, however, now gained fast upon her, and presently a puff of smoke from the bow of the foremast was followed by the report of a gun. My grandfather could look no longer through his glass, for his hand shook like a reed, but began with huge strides, more resembling those of a kangaroo than a quiet middle-aged gentleman, to descend the rock. Breathless,

he reached his quarters, had his horse saddled, and brought out, and galloped off towards Europa.

Europa Point is at the southern extremity of the rock, and commands at once the entrance of the bay and the passage of the Straits. The road to it from the north, where the Major was quartered, affords, for the most part, a view of the bay. Many an anxious glance did he cast, as he sped along, at the state of affairs on the water. The feluccas fired several shots, but all seemed to fall wide, and were probably intended only to frighten the chase, out of consideration for her fair freight. Still, however, the English colors floated, and still the cutter held her course.

Some artillerymen and an officer were assembled at the Point as the Major galloped up.

"Can't you fire at 'em?" said he, as he drew up beside the battery.

"Too far off," said the Lieutenant, rising from the parapet on which he was leaning, and showing a drowsy unshaven countenance; "we should only frighten them."

"By heavens!" said my grandfather, "'tis horrible. I shall see the boy taken before my eyes!"

"Boy!" quoth the Lieutenant, wondering what peculiar interest the Major could take in the smuggler. "What boy?"

"Why, Owen of ours—he's running away with a Spanish lady."

"The devil!" cried the Lieutenant, jumping down. "What, Garry Owen!—we must try a long shot. Pull those quoins out (to a gunner). Corporal, lay that gun; a dollar if you hit the felucca. I'll try a shot with this one." So saying, he laid the thirty-two pounder next him with great care.

"Fire!" said he, jumping on the parapet to see the effect of the shot. At the second rebound it splashed under the bows of the leading felucca, which still held on. She was now scarcely three hundred yards from the cutter.

"Why, d—n their impudence!" muttered the Lieutenant, on seeing his warning pass unheeded, "they won't take a hint. Corporal, let drive at 'em."

The Corporal earned his dollar. The shot went through the side of the felucca, on board of which all was presently confusion; in a few minutes it was apparent she was

sinking. The other, abandoning the chase, went to the assistance of her consort, lifting the crew out, some of whom were evidently hurt.

"A blessed shot!" cried my grandfather, giving the lucky Corporal a bit of gold; "but I'm glad they're picking up the crew."

The cutter instantly stood in for the harbor, and half an hour afterwards the Major bade his young friend and Juana welcome to Gibraltar.

Carlota was beside herself with joy at seeing the wanderers safe. She first cast herself upon Juana, and cried over her; then embraced the Ensign, who made no scruple of kissing her; lastly, threw herself tenderly upon the Major, who gazed over her head as it lay on his shoulder with a dismayed expression, moving his arms uneasily, as if he didn't know what he was expected to do with them. Every moment it was becoming clearer to him that he was a compromised man, no longer his own property. On his way through the streets that morning he had passed a knot of officers, one of whom he overheard describing "Old Flinders" as "a sly old boy," for that he "had run away with a devilish handsome Spaniard—who would have thought it?" "Ay, who indeed!" groaned the Major, internally. But the seal was put to his doom by the Colonel, who, when he went to report himself, slapped him on the shoulder, and congratulated him on his happiness. "Fine woman, I hear, Flinders—didn't give you credit for such spirit—hope you'll be happy together." The Major, muttering an inarticulate denial, hastily retreated, and from that moment surrendered himself to his fate an unresisting victim.

About dusk that night, Owen came to him.

"By heavens!" the Ensign began, throwing himself into a chair, "I'm the most unlucky scoundrel! Nothing goes right with me. I promised myself that this should be my wedding night—and here I am, as forlorn a bachelor as ever."

"What has gone wrong?" inquired my grandfather, removing his pipe from his mouth.

"I pressed her with all my eloquence," said Owen; "reminded her of her promise to marry me the day we should arrive here—of the necessity of caring for her reputation, after leaving her father's house and coming here under my protection" (here my grand-

father winced;) "talked, in fact, like an angel who had been bred a special pleader—yet it was all of no use."

"Deliberating about marriage!" said the Major, "after leaving her father and lover for you! What gnat can she be straining at, after swallowing a camel of such magnitude?"

"A piece of female Quixotry," returned Owen. "She says she can't think of such selfishness as being comfortably married herself, while Carlota is so unhappy, and her fate so unsettled." Here he made a significant pause; but my grandfather was immovably silent, only glancing nervously at him, and smoking very hard.

"In fact, she protests she won't hear of marrying me, till you have settled when you will marry Carlota."

"Marry Carlota!" gasped the Major in an agonised whisper.

"Why, you don't mean to say you're not going to marry her!" exclaimed the Ensign, throwing a vast quantity of surprise into his expressive countenance.

"Why—why, what should I marry her for?" stammered the Major.

"Oh, Lord!" said Garry, "here will be pleasant news for her! Curse me if I break it to her."

"But really now, Frank," the Major repeated—"marriage, you know—why, I never thought of such a thing."

"You're the only person that hasn't, then," rejoined Owen. "Why, what can the garrison think, after the way you smuggled her in; what can she herself think, after all your attentions?"

"Attentions, my dear boy;—the merest civility."

"Oh,—ah! 'twas civility, I suppose, to squeeze her hand in the inn at Algeçiras, in the way she told Juana of—and heaven knows what else you may have done during the flight. Juana is outrageous against you—actually called you a vile deceiver; but Carlota's feeling is more of sorrow than of anger. She is persuaded that nothing but your ignorance of Spanish has prevented your tongue from confirming what your looks have so faithfully promised. I was really quite affected to-day at the appealing look she cast on me after you left the room; she evidently expected me to communicate her destiny."

My grandfather smoked hard.

"Lots of fellows would give their ears for such a wife," pursued the Ensign. "Love-lace, the Governor's aide-de-camp, bribed the waiter of the hotel to lend him his apron to-day, at dinner, that he might come in and look at her—swears she's a splendid woman, and that he'd run away with such another to-morrow."

Still my grandfather smoked hard, but said nothing, though there was a slight gleam of pride in his countenance.

"Poor thing!" sighed Garry. "All her prospects blighted for ever. Swears she never can love another."

At this my grandfather's eyes grew moist, and he coughed as if he had swallowed some tobacco-smoke.

"And as for me, to have Juana at my lips, as it were, and yet not mine—for she's as inflexible as if she'd been born a Mede or Persian—to know that you are coming between me and happiness as surely as if you were an inexorable father or a cruel guardian—worse, indeed; for those might be evaded. Major, major, have you no compassion!—two days of this will drive me crazy."

The Major changed his pipe from his right hand to his left, and, stretching the former across the table, sympathetically pressed that of the Ensign.

"Do, Major," quoth Garry, changing his flank movement for a direct attack—"do consent to make yourself and me happy; do empower me to negotiate for our all going to church to-morrow." (My grandfather gave a little jump in his chair at this, as if he were sitting on a pin.) "I'll manage it all; you shan't have the least trouble in the matter."

My grandfather spoke not.

"Silence gives consent," said the Ensign, rising. "Come, now, if you don't forbid me, I'll depart on my embassy at once; you needn't speak, I'll spare your blushes. I see this delay has only been from modesty, or perhaps a little ruse on your part. Once, twice, thrice,—I go." And he vanished.

The Major remained in his chair, in the same posture. His pipe was smoked out, but he continued to suck absently at the empty tube. His bewilderment and perturbation were so great that, though he sat up till two in the morning, during which time he smoked eleven pipes, and increased the two glasses of grog with which he was accustomed to prepare for his pillow to four, he

was still, when he went to bed, as agitated as ever.

In this state of mind he went to the altar, for next day a double ceremony was performed, making Owen happy with Juana, and giving Carlota a husband and me a grandfather. The Major was more like a proxy than a principal in the affair; for Owen, taking the entire management upon himself, left him little more to do than to make the necessary responses.

Carlota made a very good-tempered, quiet, inobtrusive helpmate, and continued to be fond of her spouse even after he was a grey-headed colonel. My grandfather, though credulous in most matters, could with difficulty be brought to consider himself married. He would sometimes seem to forget the circumstance for a whole day together, till it came to be forced on his recollection at bedtime. And when, about a year after his marriage, a new-born female Flinders (now my venerable aunt) was brought one morning by the nurse for his inspection and approval, he gazed at it with a puzzled air, and could not be convinced that he was actually in the presence of his own flesh and blood, till he had touched the cheek of his first-born with

the point of his tobacco-pipe, removed from his mouth for that purpose, making on the infant's countenance a small indentation.

The little Governor, Don Pablo, was subsequently induced to forgive his relatives, and frequent visits and attentions were interchanged, till the commencement of the siege put a stop to all intercourse between Gibraltar and Spain.

I have often, on a summer's evening, sat looking across the bay at a gorgeous sunset, and retracing in imagination the incidents I have related. My grandfather's establishment was broken up during the siege by the enemy's shells, but a similar one now stands on what I think must have been about the site of it. The world has changed since then; but Spain is no land of change; and, looking on the imperishable outline of the Audalucía hills, unaltered, probably, since a time to which the period of my tale is but as yesterday, it is easy for me to "daff aside" the noisy world without, and, dropping quietly behind the age, to picture to myself my old-fashioned grandfather issuing forth from yonder white-walled town of Algeciras with his future bride.

THE public are now admitted to view the sarcophagus which contains the remains of the late Duke of Wellington in the crypt of St. Paul's. The material was sought upon the continent, but in vain; and at length it was determined to appropriate for the purpose a huge porphyry boulder, which had lain for ages upon the Trefray estate at Luxulyan, in Cornwall. Here, in the field, whereon it was found, the intensely hard material was cut into the form of a sarcophagus, and polished by steam power, and, being completed, was conveyed to the cathedral, to be deposited in the centre of the cryptal chamber already mentioned. The color is rich reddish brown, with yellowish markings; and the sarcophagus is placed upon a base of light granite, each of the four corners being sculptured with a lion's head. On one side of the sarcophagus is inscribed, "Arthur, Duke of Wellington," and upon the opposite side, "Born May 1, 1769. Died Sept. 14, 1852," and at each end, and upon a boss is an heraldic cross, the outlines of which, as well as those of the inscription, are in gold, which has a rich effect. In each angle of the chamber is a candelabrum of highly polished red granite, from which rise jets of gas to light the apartment. The floor is laid with Minton's tiles, and the appearance of the tomb and the

sepulchral chamber, if not sumptuous, is grand and massive. The tomb is stated to have cost £1100.

ENGLISH CHARACTERISTICS.—We English are not a very emotional people; even when we do feel very strongly, we nevertheless think it good breeding to betray nothing of the matter. We are apt to treat even a great feeling as the Spartan boy treated the fox hidden under his garment, suffering it to prey upon our very bowels rather than by any word, gesture, or expression, to discover what we are harboring. This is our insular characteristic. We all of us have it more or less, from the duke to the duke's footman; the excess of outward indifference being the allowed test of the highest breeding. Educate a man into the insensibility of a post, and you make him a perfect gentleman; render a young lady seemingly pulseless as a prize turnip, and she is the perfection of the very choicest female nature. This is the discipline of high life in its very highest; but the frost descends to the very roots of society. We button up our hearts as we button up our great-coats, all the more resolutely if our hearts, like our great-coat pockets, happen to have any thing valuable in them.—*Jerrold*.

From Chambers's Journal.
MY FIRST PLAY.

WHEN first any thing new happens to us, it is an event, not only for the time being, but for the future. Thoughts, feelings, and intelligences unknown before, spring up and give birth to others which never again seem to leave us, and which indirectly, but certainly, influence our future actions and sentiments, although we may not take the trouble of tracing to their sources "the little things" which gave the first tiny tinge of color to what forms our present and permanent bent of character. I had never seen a play of any kind, and had heard marvellously little about plays or scenic representations in general. To be sure, my nursery-maid, Mary, talked occasionally about the "theater," and had even told me a long story concerning one Jane Shore, and a wicked king, whose wickedness, I concluded consisted in making the said Jane Shore cry water-cresses, as it was apropos to hearing that beautiful, melancholy, but now obsolete cry "Buy my water-cresses," that she for the first time related the pathetic tale—assuring me that such was undoubtedly both the mode and the tune by which the lovely and unfortunate prototype of the dirty draggel-tail drab then passing us, used to call the attention of the Londoners, two or three thousand years ago to the fresh leaves she had been forced to gather for them, to eat with their bread and butter, early in the morning, at the cold brook-side, before the wicked tyrant himself, or the sun, or the birds were awake.

Mary, being somewhat romantically and sentimentally disposed, dealt chiefly in tragedies where ladies died for love of handsome young gentlemen, who stamped about and stabbed each other in measured time, which she practically demonstrated, by making a ferocious attack on a pillow with a poker; which pillow, after having performed the part of a rival lover was rendered available in smothering Desdemona—that is, the unconscious cat, which never would lie quiet and allow itself to be killed as that exemplary wife did, but ran mewing and spitting under the bed. She was not it must be confessed particularly clear in her descriptions; and there was a strange jumble of kings and queens in crowns, poisoned cups, bloody daggers, gold waistcoats, purple and crimson robes, ermine and suits of armor, helmets, battle-axes, and clash-

ing swords, wailing, woe, death, and dismay, dancing in confusion through my childish brain, and filling me alternately with curiosity, terror, delight, and a strong desire to witness myself the wonders she dilated upon.

One Monday morning, when snow lay thick on the ground, frost in the very air of the house, I sat with purple nose and red fingers at the schoolroom piano, picking out a new music-lesson, my father unexpectedly entered—a very unusual event with him. He hoped I was a good girl; and then, in case my prim governess should insinuate anything to the disadvantage of my character, quickly added: "We have secured a box on Thursday at Covent Garden, and mean to take you, Lilian, where I hope Miss Birch," turning to the governess—"will also do us the favor to accompany us." Whereupon Miss Birch's countenance, hitherto any thing but smiling, brightened; she graciously signified her assent to the proposal, saying: "I was a very good girl, and deserved indulgence." Although this was in direct contradiction to the opinion she had expressed to myself some ten minutes before, I was not disposed to be critical, but jumped up in a fever of joy, kissed first my father, and then Miss Birch, my blood circulating so rapidly, that before the former had well closed the door, neither purple nose nor red fingers remained.

What was it to me now that the fire burnt low, or that the streets were covered with snow; was I not going to the play? I bustled through my lessons with unusual energy; and the moment the clock struck twelve, bounded off to the nursery, where my little sister Susan always staid until she joined me at two to commence her lesson also. The joyful news had already been imparted there, and Susan was longing for my arrival to talk over our anticipated treat with Mary, who entered into our feelings most good-humoredly, but told us she did not think we should see Jane Shore, inasmuch as that was an entertainment of too lofty a nature to take children to; but she daresayed that we should see "harleyqueen and columbind," more amusing, and better suited to our intelligence; and then she nothing loath, tried to enlighten us in the same confused manner she had before attempted to describe her favorite tragedies; leaving our little minds in a tangled maze, which only still more whetted our curiosity. How Tuesday and Wednesday passed it is

equally impossible to recollect as imagine. Going to the play was ever present; and the time seemed so far off, we feared it never would come. Thursday, I remember, was a rapid thaw. I suppose it had begun before, for by the middle of the day, no snow was to be seen or frost felt, the sun shone on our anticipated treat; no lessons were thought of, for Miss Birch, who had her "frock to trim" most generously gave us a holiday. We were to dine late, and our parents early—all together! because we were going to the play as we duly informed every person we saw, and to have a cup of *café à la crème* to keep us awake; not that there was the slightest danger, we felt sure, of our ever wishing to sleep; but we wisely kept that conviction to ourselves, lest the *café* should be struck out as unnecessary.

Every one knows the particular rumble of his own carriage; that evening, however, we made several mistakes. "There it is," was said a dozen times before there it really was, but at last it did positively come just at the very minute it was ordered, old John Gemmel, the coachman, knowing full well where we were going and who was going. So jumping bustling, laughing, squeezing each others' hands, and pinching our mamma's till she wisely bethought herself of elevating them out of our reach, we allowed our little white satin tippets, edged with swandown, to be tied on, smelling of cedar drawers, lavender, and dried roses—a mixed odor which, when inhaled, even at this day, restores to me the feelings of that happy hour. A happy hour it was; for

"All things please when life itself is new."

Although it was yet the days of oil lamps—never having been out in an evening before—to our unaccustomed eyes, the streets seemed brightly illuminated. The shops were one blaze of light; and we shouted with glee as we rolled on past mercers and milliners, perfumers and chemists, dazzling the eyes with a rapid succession of the brightest colors; grocers and green-grocers with their shows of figs and chestnuts, almonds, raisins, apples, pears, and all sorts of good cheer; pastry-cooks' shops, resplendent with snow-capped twelfth-cakes; toy-shops, with dolls and drums and baby-houses, in every variety! all looking twice as tempting as by day; but yet we pitied the poor people behind the counters, and their customers, for they were evidently not going to the play. Much we

wondered to see grown persons, who, of course, could always do just as they pleased, composedly walking away from the goal of our desires; and felt certain every one going in the right direction along the glistening pavement, wet with a recent shower, must be "going to the play." It seemed a long way off; and so many new sights and feelings were succeeding each other, that to us it appeared at least ten miles. At length, carriages increased; cries met our ears of "Bill of the play," "Oranges," and so forth; link-boys flashed their torches; coachmen cut in and cut out, and lashed and swore—we stopped—we went on—we stopped again—we were come to the playhouse door at last! Lifted out by the footman, my father took my little sister by the hand, whilst I followed between my mother and Miss Birch. We now talked no more, and jumped no more, for a sort of overwhelming feeling of mixed joy and fear kept us still as we walked along the lobbies. The box-door suddenly opened; and the lights, the sea of heads, the uproar the gods were making at that particular moment, heard amidst the tuning of the orchestra, the cry of "Music," "O. P.," "Turn him out," "Throw him over," had such an effect upon my excited feelings, that I really think, for a moment I lost consciousness. When I came to myself, I found we were all, except my father, seated in the front row, and the overture about to begin. Passionately fond of music, and knowing every popular air, of course this overture, where many were introduced, was a great treat, and one I had not counted upon. It was short, for at Christmas, children form the greatest part of the audience, and what is likely to please them is then more attended to than at other seasons.

I cannot now remember what the name of the piece first acted was; but although I knew it was make-believe, I still could not help fancying it real: the scenery was so like nature; for we saw it from the centre-boxes, which favor the illusion; only the ladies were almost too beautiful for flesh and blood, or anything but wax; however, they sang and danced in a haymaking scene, which, but for these beautiful wax-doll ladies, would have been just like the real country, as I had seen it at my uncle's the summer before, where coldhopping clowns and rosy-cheeked ragged rustics figured instead. And there were also

warriors in plumed helmets, such as I read of in my story books; but I could hear with difficulty so far off, and could not comprehend what the gentleman ranted, and the ladies kept whining about. At last it came to an end; and although we entertained some fears that all was over, our patience was helped by an orange and a bun; and, after an overture, even prettier than the last, came the pantomime.

Ah, these were the palmy days of pantomimes! Grimaldi was clown; Bologna, harlequin; and Mrs. Parker, who, though sixty, the age of my venerable grandmamma, looked as young and as blooming, and danced far better than any of the aforesaid haymakers—Mrs. Parker, who never grew old was Columbine. Perhaps I confuse, perhaps I may be introducing parts of another pantomime, or perhaps there were three pieces played; but a live elephant and horses appeared on the stage in Bluebeard; and along with my reminiscences of that tragedy, the cabbage man is intimately connected. A pumpkin formed the head; a cabbage, the body; carrots, the arms; radishes, the fingers; rolls of Epping butter, the legs; and Dutch cheeses, the feet. Whilst I was wondering what Grimaldi could mean, after making his marketings disguised as a farmer, and laying them together with such care, up jumped this vegetable man, and pursued him round the stage. Certainly a foreshadowing of Frankenstein; perhaps the origin of that remarkable book. Then harlequin entered an apothecary's shop, struck with his wand three large drug bottles, and out jumped three little devils, with horns and tails, instead of the medicine they were supposed to contain. "Nothing is new under the sun," this was undoubtedly a homœopathic hint, whilst yet homœopathy was in embryo; but, I suppose, I must have been rather below par as to intelligence, for one of these poor little imps got hurt in some way, and emitted most doleful cries before he was extricated from his drug-bottle; and in recording the fact, I almost awaken the feelings of shame of that moment—I, alone, of all the immense audience, in that immense Covent Garden Theatre, laughed. I heard my own laugh; I saw every eye in our vicinity turn upon me, and then I understood it all, and felt myself a fool; for it was *not* "part of the

play" as I in my ignorant simplicity, thought. The unfortunate child *was* hurt and frightened both. How utterly miserable I felt is more than words can convey. I did not dare look up for long; but when at last I ventured to do so, to my great surprise, and greater relief, no one appeared to be aware of my existence; all eyes were directed towards the stage; so, with the happy *insouciance* of childhood, I soon forgot my humiliation; I was as much engrossed with the moving scene as before.

The greatest of pains and the greatest of pleasures come to an end sometime or other and, although our kind parents, stifling their yawns, remained until the curtain fell, that we might see the whole, we both declared we should like it all to begin over again. Once in the carriage, however, nature resumed her sway, and we fell so fast asleep, that we were undressed and put to bed without awakening, and our slumbers were dreamless; but early next morning we were alive again, calling to each other from our little beds, humming the airs, singing the songs, acting the scenes we had witnessed the night before. For many successive nights, however, clowns and columbines, harlequins and helmeted heroes, chased each other through our midnight visions; and my imitation of Mrs. Parker was so successful, that Monsieur Ricochet declared I must have practised in my sleep, so astonishingly had I improved since the preceding week. My sister attempted to read with the emphasis the actors recited, and although it must have been most intensely ludicrous, this new fancy certainly laid the foundation of a better style of reading than the unchanging sing-song, she was before remarkable for. The happiness of this our first play did not terminate when the curtain fell, for even now, as I write the above description of what occurred so long, long ago, I seem to live it over again; the tunes start up in my mind, the perfume of my white satin tippet in my nose; for a moment, all the innocent imaginings of that period of life are mine once more; and not only mine, but my little daughter and niece find the description so pleasant, that they have had it read over to them three times, which makes me hope it may meet with the approbation of other young readers of *Chambers*, and so I send it.

From The Edinburgh Review.

1. *Essays on the Spirit of the Inductive Philosophy, the Unity of Worlds, and the Philosophy of Creation.* By the Rev. Baden Powell, M.A., F.R.S., &c., Savilian Professor of Geometry in the University of Oxford. London: 1855.
2. *The Correlation of Physical Forces.* By W. R. Grove, Q.C., M.A., F.R.S., &c. Third Edition. London: 1855.
3. *On the Conservation of Force.* By Professor Faraday, D.C.L., F.R.S., &c., &c.
4. *Essays from the Edinburgh and Quarterly Reviews, with Addresses and other Pieces.* By Sir John F. W. Herschel, Bart., K.H. London: 1857.
5. *The Soul in Nature.* By the late Professor Oersted. Translated by the Misses Horner. London: 1852.
6. *Nomos. An attempt to demonstrate a Central Physical Law in Nature.* London: 1856.

ALMOST every age of human history has either given to itself, or received from posterity, some epithet, marking, whether truly or fancifully, its distinctive place in the records of the world. It would be easy to find and to apply many such epithets to the remarkable period in which our own lot is cast; abounding, as it does, in characteristics which distinguish it from any that have ever gone before. One, which we cannot doubt that our own posterity will adopt, inasmuch as it affirms a fact equally obvious and certain, is, that we are living in *an age of transition*;—a period when changes, deeply and permanently affecting the whole condition of mankind, are occurring more rapidly, as well as extensively, than at any prior time in human history. The fact is one which lies on the very surface of all that we see in the world around us. No man of common understanding, even in the narrowest circle of observations, but must mark the continual shifting of things before him; reversing, in many cases, the maxims and usages which are the inheritance of centuries, and altering, in a thousand ways, the present conditions of material and social life. The philosopher who looks from a higher level, and upon a more distant horizon, discerns in these changes a wider and more lasting influence. He sees that they involve the relations of races and communities of men over the whole face of the globe; and that they are destined, sooner or later, to obliterate many of those diversities and lines of demarcation, which, however originally pro-

duced, seemed almost to dis sever the species, in the contrasts of human existence they afford. He takes further note of what is the great agent in this and other changes, that wonderful progress in physical philosophy, which has placed new powers in the hands of man—powers transcending in their strangeness and grandeur the wildest fables and dreams of antiquity; and the effects of which are already felt in every part of the habitable earth. He sees the march of discovery continually going on; new paths opened; new instruments and methods of research brought into action; and new laws evolved, giving connexion and combination to the facts and phenomena which unceasingly accumulate around us.

Closely, or even necessarily, connected with the changes last denoted, is the topic to which, as suggested by the works before us, we would especially invite the attention of our readers. We allude to the concurrent changes taking place in the spirit and scope of physical philosophy at large; scarcely less remarkable in their nature and influence than the discoveries in which they originate, and by which they are sanctioned. Modern science, in its dealings with the great physical powers or elementary forces which pervade and govern the material world, has been led, or even forced, into a bolder form and method of inquiry. Inductions of a higher class have been reached, and generalizations attained, going far beyond those subordinate laws in which science was formerly satisfied to rest. Experiment and observation, as the agents in acquiring knowledge, must always to a certain extent be alike in their objects and methods of pursuit. But the precision and refinements of modern experimental research—partly due to greater perfection of instruments, partly to the higher principles of inquiry pursued—strikingly distinguish it from that of any anterior time. With every allowance for illustrious exceptions, it is impossible to make the comparison, and not to see that the physical researches of our own day have a larger scope and more connected aim—that experiment is no longer tentative merely, but suggested by views which stretch beyond the immediate result, and hold in constant prospect those general laws which work in the universe at large. Nor is the power so gained ever now permitted to be dormant or inert. If thought suggests experiment, experiment ministers fresh materials to thought; and the philosopher working boldly with the

new forces at his command, and under the guidance of hypotheses, which extend to the very confines of human intelligence, obtains results which almost startle the imagination by the inroads they seem to make on the mysteries beyond. When flying along the railroad at forty or fifty miles an hour, with a slender wire beside us, conveying with speed scarcely measurable, the news of nations, the demands of commerce, or the fates of war, we have an example (though few care to estimate it fully) of those mighty attainments which bind, to our bidding, elements before unknown or uncontrolled by man; and which give certainty of other and similar attainments in time yet to come.

Admitting that hypothesis, and this often of very adventurous kind—the “*animi jactus liber*”—blends itself largely with the recent progress of physical science, we would in no way impugn this powerful instrument and aid of research; the use of which, under due limitation, is justified equally by reason and experience. In all inquiries of this nature, except those of strictly mathematical kind, certainty and conjecture necessarily and closely commingle. The speculation or bare analogy of one day becomes the scientific induction of the next; and even where hypothesis is not thus happily fated, it still has often high value as a partial interpreter and provisional guide to the truths sought for. All sciences, and very especially those of optics, of chemistry, of electricity, furnish notable instances to this effect; and have rescued hypothesis, in the philosophical sense of the term, from the vague reproach which it was once the fashion to cast upon it. Such vindication, however, affords no sanction to that spirit, which pushes mere speculation far in advance of experiment and observation, and adventures rashly into fields not prepared for human culture, if indeed ever accessible to it. Eccentric theories of this kind, the produce of imperfect knowledge or illogical understanding, will ever be found in the path of science; perplexing, it may be, to those who loosely follow it; but disappearing one after another, as truth pursues its steady course amidst them. The mysteries of organic life, approached with caution by the true philosopher, are an especial seduction to these framers of new systems,—systems which it becomes easy to coin, under shelter of a vague phraseology, and aided by the very obscurity of the subject.

While speaking thus generally on the spirit and methods of modern science, we may notice the fact, that there is scarcely one of the legitimate hypotheses of our own time, or even any great law founded on the soundest inductions from experiment, which is not pre-figured in some way, more or less distinctly, in the philosophy of former ages. We might, had we space for it, give many curious instances of these anticipations; and assign reasons why they should especially be found in the more recondite parts of philosophy, such as the origin of matter, the qualities and combinations of atoms, the theories of space, ether, forces, &c.,—transcendental questions which press themselves upon the thought of the metaphysician, as well as of the naturalist and mathematician, in contemplating the phenomena of the universe. Through these avenues of thought and speculation, little aided by experiment or systematic observation, the subtlety of a few rare spirits in each early age came upon the traces of physical truths, which modern science has approached by more certain roads, and made the lawful prize of inductive research. What were then hasty and transient glances into these profound parts of philosophy, have now become a steady insight into the great physical laws under which are embodied all the phenomena of the natural world.

We have placed at the head of this article the titles of several recent works, well fitted, by their various merits and by the eminence of their authors, to illustrate the view we have briefly given of the present aspects of physical philosophy, as well as to indicate those future prospects of science, which may fairly be inferred from the spirit in which it is now pursued—the attainments still possible to human reason or human power. These are the points to which we now seek especially to direct attention. We might easily double or treble the number of the volumes thus referred to, were we to include even a small proportion of the systematic or elementary works; the lectures, memoirs, or addresses to scientific bodies; or the articles in reviews and other periodicals, which, under the influence of this new vigor of inquiry, and the practical popularity of many of its topics, have opened their pages to meet the demand for more familiar information than scientific treatises can afford. These topics, in fact, include not only the sciences treating of the

simpler inorganic conditions of matter, and the elementary forces,—heat, light, electricity, gravitation, chemical affinity, which act upon the material world,—but also animal and vegetable physiology in their whole extent, and those wonderful laws of organic life, connecting matter with vitality, instincts and intellect, under the numberless forms and species which are placed before us for our contemplation. In surveying this vast field of natural knowledge, for the purposes just indicated, we must of necessity limit ourselves to a broad outline; thereby forfeiting in some part the interest which belongs to the familiar details and illustrations of each particular science; but gaining in compensation a more connected and comprehensive view of the relation between the different sciences; and of those great discoveries in all, which are ever tending to bring them into closer approximation and subjection to common laws. We need scarcely dwell on the importance of such general views, and their influence on the spirit and progress of physical philosophy. We shall have occasion immediately to illustrate it, in speaking of the efforts made by some of the most eminent men of science of our day, to give concentration and unity to parts of physical knowledge, and to classes of phenomena, hitherto regarded as having no co-relation or common principle of action.

We do not undertake to analyse in detail, or even to notice all the works before us. To some of them, however, and especially to those placed first on the list, we must separately refer, inasmuch as they furnish the most able exposition of those doctrines and methods of modern science which it is our object to examine. And under this view we must first notice the volume of the Rev. Baden Powell, Savilian Professor of Geometry at Oxford; not merely from the high scientific reputation of the author, but as embodying, and vindicating in great part, all the boldest conclusions derived from recent research. Approaching our subject through this work as the threshold, we enter at once on the highest debateable ground, amidst questions which have more or less perplexed the reason of man in all ages; formerly, as intellectual problems or paradoxes only, now, as the natural or necessary result of those experimental inquiries which have been carried through every part of the material creation.

Professor Powell's work includes three

separate essays:—one on the "Spirit of Inductive Philosophy," another on the "Unity of Worlds," the last on the "Philosophy of Creation." The second of these essays, though containing much other valuable matter, is mainly an answer to that remarkable volume entitled the "Plurality of Worlds," which, despite its anonymous form and paradoxical argument, has gained credit and weight in the public mind from the eminent name attached to its probable authorship. The curious raised, or rather revived, by this work—one destined from its very nature to be answered by *presumption* only—has already elicited so much active controversy, in which we have ourselves taken part, that we refrain from touching upon it here; though we might fairly do so as an example of the altered method in which such controversies are now carried on, and of the new class of proofs brought forward for their solution. But of the first and third of these essays of Professor Powell we must speak more in detail, in their bearing upon the subject before us.

They are written, we may first remark, with great vigor and ability of thought; with much of happy illustration, derived from the very large scientific resources of the author; and in a style singularly fitted to these subjects by its clearness and precision. Of the boldness of the work, in advocating doctrines and hypotheses not yet fully matured by research, we have just spoken. It would not be a harsh criticism to say that Professor Powell shows a marked fondness for what is new and arduous in philosophy; and takes pleasure in stigmatising, as hindrances to truth in physical science, all such opinions as are fostered by ancient and popular belief, including those which assume Scriptural authority for their foundation. In his just zeal against dogmatical authority, he sometimes falls into the opposite rashness of lending his authority and favor to hasty and partial experimental deductions; or to doctrines still in their infancy, and checked or controverted by opposite opinions of equal weight. To this temperament of mind, as we venture to describe it, we may attribute his somewhat eager adoption of the doctrines of "Transmutation of Species;" of "the Unity of Composition" as a principle in physiology; of the principle of "Continuity and immutability of physical laws in geology;" and of

the Correlation or community of vital and physical forces in all the automatic acts of life, and even in many mental acts which may be thus regarded. His reasonings on the doctrine of Final Causes, or *Teleology*, as it is now the fashion to call it, have the same character and bearing. All these are broad questions, and fairly open to argument and evidence. But we have the constant feeling in the volume before us, that the leaning is too much to one and the same side of these questions:—we might fairly call it the *paradoxical side*, while admitting at the same time, that paradoxes are often raised into the class of recognised truths; and, in a certain sense of the term, may even be deemed instruments of science, though instruments ever to be used with caution and forbearance. As a more special instance of what we have just mentioned, we might quote the sort of sanction our author gives to the crude experiments of Messrs. Crosse and Wickes on the seeming creation of animalcule life under certain conditions of the galvanic current;—a conclusion loosely drawn in its origin, without any known analogy, and not justified by any later research. On this point, as on many others in his third Essay on the "Philosophy of Creation," we find a close approximation to the doctrines of the "Vestiges of Creation," another well-known work of our own time, which by its ability has contributed greatly to diffuse a taste for these transcendental inquiries in science, — a dangerous effect, were it not corrected by the contemporaneous activity of those philosophers who make experiment and strict induction the sole measure and guides of their progress.

To the questions stated above we may especially refer, as examples of the class of profound problems on which modern science exercises itself; seeking their solution by experiments and observations far more refined and exact, than have ever before been applied to these inquiries. But there is another question largely discussed in Mr. Baden Powell's work, to which we would advert, as expounding better than any other the present spirit and scope of physical philosophy. This is the doctrine described by our author in his first essay, under the titles of "Unity of Sciences," and "Uniformity of Nature,"—terms meant to express, but expressing too strongly, those admirable generalisations which have connected under common laws

phenomena seemingly the most remote and unlike, and are continually tending still further so to combine and concentrate them. Taking the subject in this general sense, we cannot hesitate to regard it as one of the very highest which can be submitted to the human understanding. The unfulfilled objects of science, as well as its ultimate end and aim, evidently lie in this direction; and none can be indifferent to the wonderful results which every year is disclosing to researches pursued on this principle. Among those who have labored most successfully for this especial object are the eminent men whose discoveries in particular branches of science have given them merited fame in the world. If out of many contemporaries we were to select a few who have done most to elevate physical science by generalisations of its phenomena and laws, the names of Arago, Faraday, Herschel, and Humboldt occur at once as first and most illustrious in this career. These philosophers have looked upon the world of nature in its largest aspects, and made their several discoveries subservient to this great object; thereby widening the circle of facts and phenomena, and at the same time drawing them more closely towards that centre in which we find so many sciences to converge.

Nevertheless we must not allow these terms of "Unity of Science," "Unity of Principle," and "Unity of Law," to usurp too much on the understanding. Professor Powell seems to us to give undue force to such phrases; which, strictly examined, have no counterpart or reality in our actual knowledge. It is true that there is various high authority for their use, as for that of language analogous in effect. Humboldt, in several passages of his "Cosmos," and, at an earlier period, D'Alembert and Laplace, have sanctioned the general conception, though not defining it sufficiently for any practical application beyond that attempt at generalisation just noticed; and which would have existed, even if no such mysterious word as "Unity" had been used to signify the ultimate end in view. We readily admit it as probable or certain, that numerous facts, hitherto insulated or anomalous, and even whole classes of phenomena unexplained by science, will hereafter be submitted to common and known laws. And we further believe that many laws themselves now of partial application, will hereafter merge in others of higher scope and gener-

ality. We shall speedily have to notice certain cases where this amalgamation has so far advanced as to furnish an entirely new basis for research, scarcely seen or anticipated before. But admitting what we have full right and reason to presume, that this concentration may be carried yet much further, still the attainment or even the conception of unity, in any strict sense of the word, lies indefinitely beyond, shrouded by an obscurity which words may seek to penetrate, but which human intellect can reach only in that one sublime sense of the unity of the Divine Creating Power. We may reduce to a small number the many forms of matter which are elementary to our present knowledge; we may show the identity of certain forces, hitherto deemed elementary, by their mutual convertibility; we may accept the phrase of Laplace, "*Les phénomènes de la Nature ne sont que les résultats mathématiques d'un petit nombre de lois immuables*;" and yet we shall never prove that there is but one kind of matter, or one nature of force, or that a single law governs all the phenomena around us. To put forward, therefore, the phrase and conception of the "Unity of Science" as the final term of our labors, is to inflict a metaphysical issue upon them, for which there is no warranty either in reason or practical use. Bishop Berkeley had somewhere spoken of ultimate ratios in mathematics as the "ghosts of departed quantities." With like reason we might call the unity of some of our modern philosophers the "ghost of departed pluralities;" having this quality of ghosthood, moreover, that there is nothing truly tangible or substantial about it.

We have dwelt thus much on these preliminary topics because, while they indicate what may be considered the exaggerations and excesses of theory, they show at the same time that spirit and propensity of modern science of which we have before spoken; and which, duly regulated, has been the source of all its high attainments. We now proceed to such details as may best illustrate this spirit in its application to different branches of science; selecting, amidst the multitude of examples, those especially which involve either some new physical principle or some new method of physical inquiry. It has been said by one who could well estimate the value of the latter, "*La connoissance de la méthode, qui a guidé l'homme de génie, n'est pas moins utile*

au progrès de la science que ses découvertes." A new method is often indeed in itself the greatest discovery, and betokening the highest genius in him to whom it is due.

In dealing with this wide subject, the first and most material division is that between the forces acting *on* or *in* matter; and the various forms of matter, inorganic or organic, so acted upon. With full admission of the difficulty of defining the abstract nature of matter and force, and their mutual relations in the universe, this distinction is still the only one which our intelligence can apprehend, or practically apply to the objective phenomena ever present and active around us.

In regard to matter and force it may undoubtedly be affirmed, that all questions as to their nature become more difficult and abstruse in proportion as we generalise and reduce them to their simplest terms. With respect to force, more especially, the most eminent philosophers of our time, while declining any metaphysical definition, have been constrained to adopt new methods of regarding and describing it, in those various actions upon or through matter which testify to its presence and energy. Centres of force (an expression due to Boscovich in its scientific use), lines of force, polar force, &c., are terms found necessary to express the several modes of force in action, irrespectively of all questions as to its abstract nature, or special relations to matter. Under the gradual adoption of this new language, there has been a corresponding abandonment of phrases, more hypothetical in themselves, and far less fitted to aid the progress of scientific inquiry. As such we may denote that expression, current in some of our best systematic works, of the "imponderable substances or forms of matter;" which, in including heat, light, and electricity, makes assumptions wholly unproved; while in excluding gravitation, chemical, mechanical, and vital forces from the same category, it affirms a distinction which we do not absolutely know to exist in any of these cases, and which certainly does not exist in some of them. For the notion of an *imponderable element* (if notion it can be called) that of a *mode of motion of matter* might probably in each case be more truly as well as advantageously substituted. Science, it may fairly be said, is constantly tending to a better and closer form of logic in these

matters; and simple induction from facts, unfettered by names and prior notions, is here as elsewhere the best guide to all ulterior discovery.

The great problem respecting force, in the most general conception of it—as a motive power on matter, is involved in the question, whether it can ever be really lost or extinguished?—whether the seeming cessation and limits to its action are not merely conversions or translations of power, testified in other forms and effects of material change? Most persons, seemingly justified by experience, would answer at once that any force has ceased to exist, when the motions or other effects it induces on matter are no longer present. The question, however, is one which rises far above the mere evidence of the senses. Vaguely suggested at different periods, it has been adopted in a definite shape by the philosophers of our own time; forced upon them, we may say, by the course and character of recent discovery. It is the question which forms the main topic of Mr. Faraday's lecture, just referred to, on the "Conservation of Force;" and we willingly quote a few lines, both from the intrinsic weight of all that comes from this source, and as expressing what we consider to be the growing conviction of all who have grappled with this great problem of modern science.

"To admit that force may be destructible or can altogether disappear, would be to admit that matter could be uncreated, for we know matter only by its forces." . . . "Agreeing with those who admit the conservation of force to be a principle in physics as large and sure as that of the indestructibility of matter, or the invariability of gravity, I think that no particular idea of force has a right to unlimited or unqualified acceptance, that does not include *assent* to it; and also, to *definite amount* and *definite disposition of the force*, either in one effect or another, for these are necessary consequences. Therefore I urge, that the conservation of force ought to be admitted as a physical principle in all hypotheses, whether partial or general, regarding the actions of matter."

This question was forced upon the attention of men of science by the very nature of their recent researches, and the remarkable doctrine based upon them, which is now developing itself under the title of the "Correlation of Physical Forces;" a description modest as well as apposite of a theory, which, if matured, as we think it likely to be, into full

truth, will give new foundation and guidance to the whole course of physical inquiry. In the work of Mr. Grove, bearing this title, and prefixed to our article, we have the first and most able exposition of this doctrine. Partial suggestions of it, both in England and Germany, had already been derived from the results of experiment; but we owe to Mr. Grove its distinct enunciation as a physical principle, and the illustration of this principle by instances drawn from his own researches and those of others, which give it all the characters of a new physical law. Eminent in his own profession, he has made to himself a high and merited reputation in science, by his acute application of experiment to some of its most profound problems, and by the bold but precise logic with which he draws his inductions. His work, of which the third edition is before us, is remarkable for its clearness and simplicity of style—qualities valuable in all scientific writings, and essential on subjects like those here treated of.

By the term correlation, as applied to physical forces, Mr. Grove means to convey the general idea of *reciprocal production*,—that is, that any force capable of producing another, may reciprocally be produced by it. But the principle here involved, as well as the wide scope of the doctrine conveyed by these terms, will be better understood by taking correlation to express generally those relations of forces which render them mutually and constantly convertible—one form or manifestation of force generating another, so as to bring together into the same series of effects, physical actions and changes seemingly the most remote and dissimilar. Thus, to take a familiar but striking instance—the same single electrical current from a voltaic battery is capable in its circuit of evolving heat and light, of creating magnets, of producing mechanical force, of violently affecting the nervous and muscular organisation, and of inducing, by decomposition or combination, the most powerful chemical changes, simply according to the nature of the different material objects which the experimentalist interposes in the circuit, so as to subject them to this current of power. Here then (gravitation excepted) we find all the great natural forces, of which we have present knowledge, evolved from a single source; and that source, be it remarked, a chemical change of affinities, giving origin to the electrical current, and thereby affording

fresh proof of the reciprocity of actions alluded to above. One form of force disappears as another is evolved.

We might give, had we space for them, many other curious instances of this reciprocity of relation, as manifested by the several forces of heat, electricity, magnetism, mechanical power, and chemical affinity. One we may select, as an example of beautiful contrivance as well as striking results. By a certain combination of apparatus, in which light, acting through the daguerreotype, was the initiating force, Mr. Grove obtained, first the *chemical action* upon the plate; thence a current of *electricity* circulating through wires; next *magnetism* by a coil of these wires; then the production of *heat*, testified by the delicate helix of Bregnet; and finally, of *motion*, shown by the needles of the galvanometer. Instances of this kind, indeed, are rapidly multiplying, since the correlation and convertibility of forces has been recognised as a principle and applied to research. They are derived not solely from recent experiment, but even more frequently and fruitfully from phenomena already familiar to us as facts, but waiting for their illustration the happy induction now at length attained.

The beauty of this principle, however, is not limited to the expression of the reciprocity or mutual convertibility of the physical forces with which we are dealing. There is much reason to believe in a further correlation as regards their equivalents of power, or measurable quantitative effects. Though this generalisation is still far from complete, numerous cases occur where it is attested by the results of very exact experiment. The discoveries of Faraday have furnished some of the most striking examples of constant quantitative relation between electrical power and chemical actions and changes. The researches of Dulong, Petit, and Neumann show very remarkable relations between chemical affinity and heat, in proving that the specific heats of certain substances, compound as well as simple, when multiplied by their chemical equivalents, give a constant quantity as the product. And again, the experiments recently made by Mr. Joule and Professor W. Thomson, on the mutual convertibility of heat and dynamical force, go far to demonstrate the remarkable fact that, in whatever way mechanical force is employed to produce heat, the same amount of heat is produced by the same amount of force. We doubt not that the progress of science will so multiply

the number of these instances of quantitative relation, as ultimately to submit them to some general law, as well as to that practical application which is the most certain test of truth.

It will be noticed that we have not hitherto spoken of gravitation as a physical force; though it is the one with which we are most familiar in every incident of life, and to which we look as the most universal agent upon matter, as well in the globe we inhabit, as in the innumerable worlds surrounding us in space. We place it apart from other physical forces, because, while thus familiar to our senses in its effects, it is to our deeper meditation the most mysterious as well as vast and sublime of the powers which act in the universe. Human genius has discovered and mathematically defined its laws. By knowledge of these laws, human science has been carried, and is ever penetrating further, beyond our own planetary system, while within this system they have enabled us to predict events in time and space and to define physical conditions of the planets and their satellites, seemingly inaccessible by man. With all this knowledge and perpetual application of the power, of its nature and essence we are utterly ignorant. Science has dealt with its effects only, without really approaching a step nearer to the cause, than when Newton declared that he must leave to the consideration of his readers the question whether the agent producing gravity was material or not. Hypotheses have grown up—such as that of *gravific atoms* permeating all space, of Le Sage—or the *residual force* theory of Mosotti, connecting gravity with cohesive attractions—but none which satisfy fully the exigencies of the case. The research is even made more difficult by the simplicity and invariability of the power in question. It controls or modifies the other forces acting on matter, but has no such relations to them as they have to one another—no reciprocal production or mutual convertibility; nor the *quality of action* belonging peculiarly to the electrical and magnetic forces; nor lines of propagation and polarisation, such as we recognise in light and heat; nor those molecular changes manifested in acts of chemical affinity. Whether any—or if any, through what avenues,—closer approach may hereafter be made to the solution of this great problem of gravity, we cannot here inquire. But in speaking of the forces which act upon matter, it was impossible to omit this the most universal of all—innate and

incorporate, we might almost say, in matter itself.

Nor can we rightly avoid in this place some allusion to the equally abstruse subject (though rendered so by very different causes) of the mutual relations of the physical and vital forces—a topic handled with great ability by Dr. Carpenter, in a paper in the "Philosophical Transactions" a few years ago, and more recently in the systematic works of this physiologist. Without plunging into the depths of this question, we may say that the tendency of all recent research has been to impugn the doctrine of vitality, both in animal or vegetable life, as a distinct force or power; and to merge its alleged functions, whether of organisation, maintenance or reproduction, in those same physical forces which act on the inorganic matter of the world around us. That this is true to a certain extent cannot indeed be doubted. That heat and light, and more especially the former, are intimately concerned in all the phenomena of vital organisation, is a fact familiar to us from a thousand examples. The researches of Liebig and others have shown how very closely chemical processes are engaged—even under the strict law of definite proportions—in all the great processes of the highest animal life, assimilation, secretion, respiration, animal heat, &c.; while the discoveries of Matteucci and Du Bois Raymond have demonstrated the curious and exquisitely subtle relations which exist between electricity and the nervous and muscular functions; not indeed proving the absolute identity of electricity with the nervous element of force, but countenancing this view beyond all prior expectation.

In thus discussing the relation of the physical and vital forces as applied especially to man, we continually approach that line, hard indeed to discriminate or define, which separates the mere vital or automatic acts from the proper functions of mind, consciousness, thought, feeling, and volition. On this debatable land we encounter at once the old questions, so long the subject of philosophical speculation, and destined, as far as we can see, ever so to remain. Human science on this point is as feeble as it was two thousand years ago, and beset by exactly the same difficulties. We have just been speaking of forces which are correlated and measurable in their effects. We come here to powers

and functions *wholly incommensurable* either with material qualities or physical forces; yet so linked with both under the present conditions of existence, that not even personal consciousness, the best and surest of all teachers, can mark any certain boundary line. Those who have sought to decipher or define these proximate relations of matter and mind have but substituted barren words for the realities of knowledge. Mr. Baden Powell himself, while stretching the domain of physical causes to the total phenomena of animal life, yet finds a limit here; and somewhat abruptly closes his argument by observing that the assertion of a moral and spiritual nature in man refers essentially to "a *different order of things*, apart from and transcending any material ideas whatsoever." To some such conclusion, however expressed, all must come who honestly and rationally approach this question.

We have dwelt thus long on the subject of the physical forces—the "imponderables" of former systems—as illustrating at once a great doctrine of modern science, and the general spirit of philosophy at the present time. We are far, however, from having exhausted the subject. Questions crowd round and converge upon it from every side; some of them so subtle in kind that we might well call them metaphysical, had we not in some sort repudiated this term. Such are, to state briefly a few of them, the question whether forces can exist, except in absolute connexion with matter?—whether they may, intelligibly and consistently with phenomena, be regarded as molecular actions, or modes of motion in matter?—whether (to revert to a question urged before) they can ever by possibility be annulled or even rendered latent?—whether, in admitting this constant combination of forces, we do not virtually admit a *constant amount* of force, variously manifested, to be always present in the universe?—and whether, in such case, we can ever rightly speak of an *initial force*, otherwise in the sense of those acts of creation which are the beginning of all things? All these and other like questions belong to the philosophy of our day; some of them shadowed out in the hypotheses of antiquity; now approached through the safer avenues of experiment and sound induction. How far these may carry us to the future solution of the problems suggested we cannot here stop to inquire.

In passing from the province of forces acting on matter, to that of matter thus acted on, we have yet to traverse another debatable ground, on which science is seeking to find some firm footing, as well in explanation of known phenomena as for purposes of further research. We allude here to the question regarding the *physical condition of space itself*—of those inter-planetary and inter-sidereal distances, some of them hardly measurable by numbers, and such as no efforts of mind can compass or conceive. Are we to regard this vastness of space as void of matter—a mere vacuum, through which the numberless worlds we see as stars or planets are dispersed? Or may we better contemplate it, as pervaded throughout by some material medium, though so rare and attenuated, that no form of matter of which our senses are cognisant, can rightly interpret it to our reason? The question can no longer be argued in that mystical language of “nature abhorring a vacuum,” which satisfied the demands of an earlier philosophy; nor can we evade it by the adoption of terms such as *ether*, *ethereal medium*, &c., which, though sanctioned by some great names, go little further than to shelter a vague and incomplete solution. Modern science seeks urgently for proof that matter, in some condition, does exist throughout space; and in such continuity, however rare it be, that forces may be transmitted *by* or *through* the medium thus afforded. Two great powers, gravitation and light, undoubtedly reach us from the most remote regions of space. There is presumption, though not certainty, that heat is associated with light in its origin, as a concomitant, if not convertible force. More doubt exists as to the transmission through space of the electric or magnetic powers; but many facts of recent observation tend to authenticate this belief. How then are these forces, or any of them, transmitted to and fro in the universe? If we say that the tides of the ocean are raised, or the perturbations of a planet produced, without any intervening medium between the bodies affected and those affecting them, we quit the domain of physics altogether, and put an abrupt end to inquiry. Newton has expressed himself strongly on this matter, in saying, “To suppose that one body may act upon another at a distance, through a vacuum, without the mediation of any thing else, by and through which their action and force may be conveyed

from one to another, is to me so great an absurdity that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it.” The conviction which his conception of gravity impressed thus strongly on Newton’s mind, is enforced upon us not less cogently by the undulating theory of light. This theory—based on mathematical proof and capable not merely of explaining phenomena before known, but of *predicting* others evolved by later research—presumes of necessity the existence of an elastic medium, whatever its nature, through which these undulations are transmitted. We say of *necessity*, because it is logically thus to our reason. Not solely on the analogy of air and other elastic media, but as the only conception we can form to the mind of undulation singly considered, the presence of a medium is essential to its existence and effects. And this fully recognised, the inferences become of magnificent kind. The progressive retardation of Encke’s comet, and the aspects of the zodiacal light, afford presumption of such material media existing within our own solar system; but the argument we have just stated, carries us far beyond this limit, to every part of that sidereal and nebular space from which light ever reaches the eye of man.

In coming finally to those several sciences which deal with matter in its more recognised forms, we must once again repeat that our object is simply that of indicating the spirit and scope of modern science, as illustrated by its new objects and methods, and by the high attainments at which it has arrived. Volumes would be needed to give even an approximate idea of the particular discoveries, whether from experiment or observation, which have conduced to these attainments. In the hasty view we are taking, we can but notice such as are most striking in character and results. Nor are we called upon to do this methodically; since, as we have before mentioned one of the most eminent successes of our time is that of having brought all the branches of physical science into closer connexion and subordination to more general laws; and in illustrating these new connexions, examples converge and crowd upon us from sources seemingly the most remote.

Humboldt, in his *Cosmos*, has rightly given to astronomy—“the science of the universe without”—the first place in his great picture of physical knowledge. So much has lately

been written on this science—the highest glory, it may well be deemed, of the human intellect—that we need only allude to a few of its more recent attainments; not surpassing indeed those discoveries which we owe to the genius of an anterior time, yet so extending the doctrine of universal gravitation in the variety and refinement of its applications, that new grandeur is given to this great law of nature. We may take one or two examples, among many that offer themselves, from our own planetary system; where this power is more within our cognisance, both in its simple effects and in those complex perturbations of orbits, which have taxed, but not overcome, the efforts of our most illustrious mathematicians. The first instance—one of those familiar to the world for the moment, but speedily forgotten—is a discovery made by means of these very perturbations. The movements of Uranus, then (1846) supposed the most remote planet of our system, were found to be disturbed by some external influence not referrible to causes *within* its orbit, as could be shown, but due to some material attraction from without. Another planet alone could answer these conditions. Science set itself to work in the persons of two eminent mathematicians, Adams and Leverrier—the position of the disturbing body was determined by them simultaneously, but independently—telescopes followed their guidance, and Neptune was added to the number of our planets. The method of discovery here has higher interest than the fact itself; though now but one of numerous instances in science, where results can be predicted with hardly less certainty than if attained and present to the senses.

A second example we may cite, in proof of the exactness, or even *delicate minuteness*, with which modern astronomy pursues the vast objects of its science. The complex irregularities of the moon's motions have long put to test all the resources of analysis, and are scarcely even yet fully submitted to our knowledge. Chiefly, of course, they depend on the relative position and distances of the sun and earth; and Laplace had shown not only the secular acceleration of mean motion, produced by the increasing eccentricity of the earth's orbit, but also a small irregularity depending on the spheroidal figure of the earth itself. His suggestion that the oblateness of the earth's spheroid might reciprocally be

determined by this irregularity of the moon's motion led Burg to a calculation, the results of which closely tallied with the best measurements and pendulum observations. Very recently new and more delicate causes of lunar disturbance have been indicated, as depending on the action of the planet Venus; first, indirectly, by perturbing the motion of the earth, altering its distance from the sun, and thereby affecting the motion and position of the moon during periods of 120 years; secondly, by a minute disturbance arising from the *direct* action of Venus on the moon itself. In all these cases the theory accords with the phenomena observed, and this accordance well illustrates the perfection of use which the great law of gravitation has now attained.

In passing the bounds of our own system—*narrow*, we may call them in relation to what lies beyond—we lose in great part the guidance of this law; though retaining such proof of its equal and probably similar operation in the most distant regions of space, as almost to force upon us the conclusion (warranted indeed by other considerations) that motion is universal and constant in all matter—that nothing in the universe around us is at absolute rest. To prove the continuous movement of the solar system in space, with the direction and rate of its motion—to confirm this wonderful fact by the discovery of the proper and absolute motions of other stars—to determine, by parallactic observations of incredible delicacy, the distances of certain of the fixed stars, and to measure these distances by the *years* which light takes to traverse them—to demonstrate, among the many thousand double or multiple stars now discovered, those orbits and periods of revolution which obey the same law that brought Newton's apple to the ground—to *gauge* by refined processes our own nebula of the Milky Way—to discover and assign the place of more than 3000 other nebulae, resolving many of them into systems of stars, and by admirable methods obtaining some approximate idea of their distances—these have been among the undertakings of modern sidereal astronomy; admirably fulfilled by the eminent men who have devoted themselves to this science, the two Herschels, Struve, Bessel, Airy, Argelander, Peters, &c. Sublime even in their simplest enunciation, these problems will be seen to involve results as to space and

time which border on infinity; and as such illustrate well those arduous efforts and aspirations of modern science which it is our especial object to indicate.

Though not easy in a science like this to set limits to its future scope, yet is it difficult to suppose any ulterior discovery which can do more than aid in filling up this vast outline. If any new law is discovered in our own system, we might perhaps presume it to be one relating to the rotation of the planets on their axes—an important series of facts arbitrary to our present knowledge, but doubtless due to determinate physical causes, and therefore fairly open to physical research. It is *possible*, seeing the distances which some comets reach in their aphelia, that another planet may exist even beyond Neptune:—the discovery, if ever made, would probably be so through the observed perturbations of Neptune itself. In the sidereal system of which we are a part, much yet remains for future completion. Nothing is more wonderful than the phenomena, periodical or otherwise, of the variable stars, which are now largely catalogued in our books. Ages may be required to gather any certain induction from our observations upon them. But ages are the field in which the astronomer works; and each present fact, duly recorded, ministers to the higher knowledge, which is the harvest of the future. The research into the proper motions of the stars, already noticed, is sure to be greatly extended, and may possibly connect itself in the end (as Mädler has already sought to connect it) with the discovery of some centre of attraction and movement to the whole sidereal system. If such central body or point in space were ever ascertained, it would still be simply an expression of the law of universal gravitation; but how sublime an expression, and how wonderful as a result of the genius and labors of man!

But the limit does not lie even here. The telescope of the astronomer, enlarged in its powers and more perfect in all its appliances, is continually engaged amongst those other sidereal or nebular systems, the remoteness of which goes far to express all that man can ever understand of the infinite in space. In a former article, already referred to (No. 208., Art. 6.), we have spoken more at large on this subject. Whoever has inspected those admirable *portraits* of nebulae, as seen through Lord Rosse's great reflector, will comprehend

in part the magnitude of this research, and of the problems it puts before us. The aspects and multiplicity of the spiral nebulae, though hardly sanctioning the notion of any new law of matter, yet well warrant the belief in some common but unknown cause conducing to this singular effect. A matter of still higher interest is suggested to us in the question, whether there exist in these nebulous lights, or elsewhere in space, matter not yet condensed or shapen into forms—the material, it may be, of future worlds, and in different stages of progressive concentration, but still not aggregated as such. The resolution into clusters of stars, by high telescopic power, of many nebulae before thought irresolvable, alters the degree of presumption, but does not settle the question. The comparison of different nebulae, as they now exist and of their several relations to centres or points of greatest condensation, would seem the sole probable avenue to further knowledge; since any changes in the figure, condensation, luminousness, or other aspects of these nebular systems must, upon every analogy of the more proximate parts of the heavens, occupy such immense periods of time as to place them beyond all present reach; and we know too little of the duration of our own species on the earth to venture on any assumption thus remote in its fulfilment.

These questions as to nebulous matter in space are deeply interesting, *retrospectively*, as well as *prospectively*, in time. Few subjects have so keenly exercised speculation of late as the hypothesis, first sanctioned by Laplace, that our own solar system, with its central sun, planets, moons, and comets, has its origin in the concentration of the matter of a nebulous sphere in successive zones; each several planet being formed by the condensation of vapor at these successive limits in the plane of a common equator; and the satellites being similarly formed from the atmospheres of the planets. It does not annul this theory to admit that there are great difficulties in conceiving the cause of such aggregation of matter at certain points, and of the permanent movements impressed on the bodies thus formed. These difficulties, whatever they be, have not prevented its eager appropriation by philosophers who hold the doctrine of progressive development according to certain determinate laws, in the

reation both of the inorganic and organic world. They find a basis for the evolution or transmutations they suppose, in this hypothesis of the nebular origin of suns and planets; and their argument would be plausible were the hypothesis itself capable of being verified. How far presumptive evidence may reach in future towards such verification we do not venture to say; but the sources of fresh knowledge are ever opening in this as in other directions of research. The most careful study of cometary phenomena; of the numerous planetoids revolving in eccentric orbits between Mars and Jupiter, of those meteors, some of which have lately been recognised as periodical in occurrence; and of the aerolites, which impinge in mass upon the earth, can hardly fail to settle some questions as to the occupation of planetary space. How curious, for example, the inference to be drawn from the composition of these falling stones, brought to us undoubtedly from far beyond our own atmosphere, or, as Laplace boldly phrases his belief, "des profondeurs de l'espace céleste!" Of the various ingredients they are found to contain, every one is familiar to us upon the surface of the earth we inhabit. They represent, indeed, fully one-third of those forms of matter which are still simple or elementary to our knowledge; though under different aspects and forms of combination. Here then we have a sort of *material ingress* into the regions of inter-planetary space; and presumption as to a common origin, though under different modes of aggregation, not merely of those fragmentary masses which casually reach us, but of the great planets also, which move with ourselves in orderly and ordered course around the sun.

We are tempted to add one or two other instances here, illustrating the manner in which modern science—resting upon the uniformity of laws, whatever the scale of their operation—has brought evidence to bear upon these vast astronomical questions from the most minute manipulations with matter here below. The happy idea occurred to M. Plateau of Ghent of suspending globules of oil within water, rendered exactly of the same specific gravity by addition of alcohol, so that the globules should be wholly exempt from action of gravity, or other extrinsic force, and free to take any position or motions impressed upon them. By means of a small metallic

disk and wires rotatory movements of various velocity and direction were produced in the spherical globules of oil, thus suspended in water; making them to assume many conditions closely allied to planetary configuration;—to become spheroids flattened at the poles;—to throw off smaller globules having movements both of revolution and rotation;—and even rings like those which Saturn shows to our telescopes. These experiments, repeated by Faraday and others, are as valid in the way of inference as they would be were the scale of operation a thousand times greater. And the same may be said of the second instance we have before us, in those beautiful instruments and inventions of Foucault, Piazzi Smyth, Wheatstone, &c., illustrating the principle of the stability and composition of rotatory motions, and thereby expounding with admirable simplicity the great phenomena of the precession of the equinoxes, and of the earth's rotation on its axis. The *gyroscope* of Foucault, set into action, and placed on a table, shows even in a few minutes, by the angular deviation from its plane of rotation, the movement the earth has made in this short space of time—a demonstration almost startling from its simplicity and grandeur. The instrument is one of consummate beauty in its other applications; and in the more compound form which Professor Smyth has recently given to it, well indicates the perfection such means have attained in furtherance of scientific research.

We have lingered somewhat long on the subject of astronomy, partly from the striking exemplification it affords of the spirit and aims of modern science; partly from the specialty of its objects, as detached by distance from those relations which so closely connect the sciences treating of matter on our own globe. But though thus distant in space, the vast masses moving in the heavens, and especially the Sun, are variously associated with the matter of the earth, through the elementary forces, of which we have already so largely spoken. Here indeed we come again into contact with those arduous questions, where mathematical aids are scantily supplied, and few certainties yet attained; but where new facts and presumptions unceasingly offer themselves, the foundation and materials of more exact knowledge. Omitting gravitation, of which we have sufficiently spoken as a power apart from the rest, there

comes that wonderful element of light; blending itself, as we have seen, with heat, electricity, magnetism, and chemical affinity, in such close correlation of action that we can scarcely dis sever its continuity, or detach these physical forces from connexion with that great source whence light itself chiefly emanates. The solar beam, as unfolded and analyzed in the spectrum, is in truth the most marvellous and mysterious object of the physical world; comprising in itself whole volumes of science, and problems that might put to trial the boldest theorist. The poetry of Milton, sublime though it be, fails to reach the reality of these great attributes of light, as evolved from a single beam, by simple refraction in passing through a glass prism. It is an analysis of exquisite order and perfection; in which not only are the several colors separated in the same constant proportions, with the intervention of numerous dark lines equally constant in their character; but rays of heat and of chemical power appear severally also at opposite extremities of the spectrum, partially interblended with those of color, but in greatest intensity beyond the visible colored limits of the spectrum. We are now speaking only of the simplest relations of the solar light to terrestrial matter; and without any immediate reference to the astonishing phenomena included under the undulatory theory of light, which, though attested by mathematicians, and interpreted by numbers, wholly transcend the powers of human conception. We allude, but cannot here do more than allude, to those formulæ of space and time expressing the amplitude and frequency of the undulations, and their variations for the several colors and rays of the spectrum; and the whole series of phenomena of interference, polarisation, diffraction, &c.—discoveries which have given or added lustre to the names of Young, Fresnel, Arago, Brewster, Cauchy, Herschel, Hamilton, and other philosophers scarcely less eminent in this great inquiry.

A word or two we must add here as to one relation—simple in fact, but not familiar to thought—which light establishes between man and the universe around. The total science of astronomy belongs in origin to this element alone. Extinguish those vivid points or bright surfaces of light, which give splendor to the midnight sky;—deprive the astronomer of the feeble rays and fainter gleams which stars and nebulae, invisible to

the eye, bring before his telescope;—and you annihilate at once that science which can predict eclipses centuries beforehand; determine the orbits and return of comets; measure the distances of the fixed stars, and the motion of our own sun and solar system in the universe of space; and penetrate into systems of worlds beyond, where relative degrees of light become the solitary evidence of form and distance. Nowhere are these relations of astronomy to light so admirably illustrated as in "Arago's Analysis of the Life and Labors of the elder Herschel," recently republished in the collection of his works.

The evidences connecting electricity and magnetism, as forces, with the Sun and other bodies of our system, are of course different and inferior to those which establish the relations of light. Yet they are now continually becoming more numerous and significant. Whoever has seen the star of pure and intense light which bursts forth on the approach of the charcoal points completing the circuit of a voltaic battery; or the *flood of light* thence poured by reflection over wide and distant spaces, cannot but suspect that the new "fountain" thus opened to the eyes of men (and certainly not destined to remain an idle and valueless gift of science) may be the same in source and qualities as that higher fountain which diffuses light and heat over the whole planetary system. Sir J. Herschel, who ever makes his highest speculations subordinate to cautious induction, has assigned strong reasons for believing the sun to be in a permanently excited electrical state. The various phenomena of the tails of comets he considers as not to be explained, but by supposing a *repulsive force*, acting from the central body, which electricity alone could furnish. "The sun electrically charged would induce opposite states in the two hemispheres of day and night on the earth," is the expression applied to the effect of this solar condition upon our own globe;* and if we suppose, as may fairly be done, variations in the intensity of this electrical state, we acquire a probable cause for many periodical or secular variations which have hitherto embar-

* These passages, with others equally remarkable, will be found in Sir J. Herschel's volume on the "Nebulae and Double Stars of the Southern Hemisphere;" a volume in which the tabular results of his vast labors of observation are intermingled with some of the highest speculations to which the human mind has yet legitimately reached.

raised science. We allude especially here, to changes in the intensity, declination, and inclination of the magnetic force—that extraordinary power which we are now led to refer to particular conditions of electricity, in its connexion with material media. General Sabine, whom the labors of a life have rendered our highest authority on magnetic phenomena, has recently, through his papers to the Royal Society, furnished full evidence, from the exact coincidence in time of magnetic changes or disturbances at remote parts of the globe, that these are due to *causes from without*, irrespective of any local conditions of the earth or atmosphere; while in pointing out the correspondence of such periodical variations with the several conditions of the sun, he has shown a direct relation of these phenomena, which we cannot refuse to admit. Diurnal or annual changes, subject to this relation, we may indeed in part comprehend; but it needs new elements of knowledge to link together in theory, as General Sabine and Schwabe have seemingly done in fact, the maxima and minima of diurnal magnetic variation, with the greater or smaller number of dark spots present on the sun's surface;—a coincidence expressed, as far as the proof now goes, by periods of ten to eleven years; but one so extraordinary in character, that we are bound still to await other similar recurrences before finally admitting it into the records of discovery.

Meanwhile the Moon also has been found, by delicate observations and averages carefully collected, to exercise a magnetic influence on the earth,—the needle expressing to human eye certain small variations which strictly correspond with the lunar hour angle. The fact has its peculiar interest in indicating, and this not vaguely, a similar influence throughout the whole planetary system, and possibly far beyond. The magnetic conditions and changes of the earth itself come into direct testimony here; so general and strictly coincident over its surface, as to give us assurance that the total globe is in a definite magnetic state; and capable through this state of affecting other worlds, as well as the little needle which man makes his index here of this mysterious force.

From these vast and remote actions in space around us, we come to those affecting the matter, whether inorganic or living, of the earth on which we dwell. The same great

physical forces are still in unceasing action here; with more diversity of effect from the differences of the material acted upon, and from the reflected influence of organic life upon the matter from which it is engendered. We have already spoken of the impossibility of giving more than a glance over this wide field; but such cursory view will suffice to show the magnitude of the objects attained in each science, and the energy which is ever active to forward the work—*τα ημῆμερα ἐς τέλος ἐξεργάζεσθαι*. On one subject, indeed, that of Electricity, though beyond any other prolific of great discoveries, we need say very little, having in a recent review of M. De la Rive's admirable work described its progress, and the wonderful results thence obtained, as well for pure science, as for the practical uses of man. Yet even amidst these marvels of human attainment, it must needs be avowed that we are still at the very alphabet of electrical science. The terms of *positive* and *negative*, though required for practical use and illustration, are little better than barren phrases as respects any real explanation of the phenomena; while the whole subject of *induction* and *conduction*, so essential to a perfect theory of electrical action, is still awaiting more certain and complete conclusions than have yet been obtained. Some single and simple observation may, perchance, furnish the truths desired; and in the very beautiful experiments recently recorded in the Bakerian Lecture of Mr. Gasiot, we willingly recognise one of those various avenues through which research may reasonably be directed towards this object. Nor can we do more here than allude to the discoveries, scarcely less remarkable than those of electricity, which concern the material phenomena of heat. Some of them we have already noticed in their connexion or correlation with the functions of the other elementary forces. But there are many besides, due to the various labors of Melloni, Forbes, Herschel, Seebeck, Clausius, Tyndall, &c., which singularly tend to confirm this connexion, and to offer other modes of access to those higher laws of force and motion, which we have denoted as the ultimate aim of all philosophy.

If seeking to denote in a few words the most striking characteristic of modern science as directed to matter, we should come at once to the principle of Molecular action, in its

present application to physical research. Through this doctrine has been made man's deepest inroad into the secrets of the natural world. No single principle is so variously applicable to every branch of knowledge; none has done so much to promote discovery, or to authenticate and give the form and force of law to the results obtained. And yet it may be said to have had a lawless origin, and to have been long a play of human phantasy under the garb of science. We cannot here travel back to those early speculations on atoms which entered so largely into the staple of the ancient philosophy; and which the poetry of Lucretius has better consecrated to later times than the most subtle prose of the Greek philosophers. In every intermediate age, even the darkest, the atomic doctrine, in one form or other, has kept a certain hold on the minds of learned or speculative men;—a natural effect of the facility with which it lends itself to any hypothesis, however crude, regarding matter and material phenomena. It was reserved for our own time to render it at once the subject and instrument of legitimate science; the foundation of laws next to mathematical in scope and exactness, and the most powerful of all aids to ulterior research.

This great achievement, for such it is, we owe mainly to Chemistry; and to John Dalton, the Quaker chemist, more appropriately than to any one besides. Close approaches had been made before to the doctrine of *definite proportions*, as represented by the molecules of matter in their combinations. Such anticipations are recorded in the case of every great discovery. But Dalton (speedily seconded indeed by other great chemists) first gave clear declaration to the principle; and illustrated its applications, mighty in their universality, with a simple sagacity belonging to the genius and habits of the man. The simplicity of his early experiments is, indeed, characteristic also of the manner in which many of the highest truths in science have been reached. Facts the most familiar to common observation, and thence disregarded by common intellects, have furnished better materials and suggestions for discovery than the most recondite theories.

It has been justly said by Sir J. Herschel that *number, weight, and measure* are the foundations of all exact science. The atomic doctrine has acquired from chemistry these conditions, which give it substance and cer-

tainty as a physical truth. When analysis and synthesis, carefully applied to compound bodies, disclosed a constant and definite proportion of the combining elements, and an equivalent or multiple ratio of parts in every chemical change, the requirements of number and weight and measure were all met by the discovery. Numbers became needful to express the proportion of the combining molecules; and in every case, even of the most complex chemical compounds, they have been found to fulfil this object so exactly, that combinations, yet unknown, may be predicted with assurance as the results of future research. The *absolute weight* of these elementary molecules is unresolved, and will probably ever remain so; but their *relative weight* is known to us through the proportions in which they severally combine; and this method is checked and counter-checked through such vast variety of compounds, that every chance of error is done away. Measure, the third condition proposed, is expressed chiefly in the combining volumes of gases—invariable always, whether under the simplest proportions shown by analysis, or the multiple measures of other chemical compounds.

Here then we have a great law, or group of laws, thoroughly attested; of high generality; and proving, because based upon, that atomic or molecular constitution of matter which alone could afford such results. Whatever name we give to them, these atomic parts exist in all bodies, and determine by their own nature or arrangement the properties and functions of each. That they are minute beyond all human measure is proved, not only by the chemical relations just denoted, but also by those relations to heat, light, electricity, and mechanical force which experiment has demonstrated to us.

No hindrance to belief need exist on this score. When, even in organic or compound material structure, the microscope tells us, by computation, that two cubic feet of the Tripoli slate of Billin contain 140 billions of fossil infusoria,—that there are some millions of distinct fibres in the crystalline lens of the cod fish,—and that a single fungus (*Bovista Giganteum*) is composed of cellules far exceeding this number—we infer in reason, though not by comprehension, what the elementary molecules must be, so organised into living forms. Looking to simple inorganic matter, or what we suppose such, we have before us a

recent memoir of Faraday's, on the "Optical Phenomena of thin Gold Films and Gold Fluids," where in one experiment a ruby tint, equal to that of a red rose, was given to a fluid by a quantity of gold not exceeding 1-500,000 part of its weight. We quote another instance from this paper, as well expounding the spirit which prompts and guides these bold incursions into the atomic world. In seeking to procure the thinnest film of gold, *retaining continuity*, for the purpose of noting its effects on light passing through it, he obtained by a chemical action on gold leaf, films not exceeding 1-3,500,000 of an inch in thickness. The number of vibrations in an inch of the red ray being 37,640, it follows that each such film cannot occupy more than a hundredth part of the vibration of light,—a deduction derived in such way from the premises as to compel belief, hard though it be for the imagination to follow it. But if in these, and other cases, the imagination fails, yet reason accepts this next to infinite divisibility of matter, and the conception of polarities and mutual relations of atoms so constituted, as the sole method of expounding the phenomena ever present around us.

Had we room here, we might fairly dwell on the astonishing results already derived from this new method of chemical inquiry, through the atomical combinations of matter; and those especially which bring new laws of action and combination into view; such as the doctrines of *isomorphism*, *atomic substitution*, *homologous series of compounds*, *compound radicals*, *catalysis*, &c., which we owe to the genius and labors of Berzelius, Mitscherlich, Dumas, Liebig, Hoffman, and other chemists. Each one of these laws, thus based on the atomic doctrine, is a special example of that spirit of profound research which we are seeking to denote in the science of our day; while the growth of organic chemistry, in sequel to labors pursued on this principle, is perhaps the most wonderful of the results thence attained. No surer test of truth in any law than its power of predicting events or effects yet unknown. When, for instance, we find in the different series of organic acids, where every step of change is made in multiple ratios of arithmetic exactness, that certain void places left in the first construction of the series are afterwards filled up by the discovery of compounds answering *precisely* to the numerical conditions required, we see

at once how much has been done towards the deciphering of this secret scroll of nature's innermost workings. Nor is the advancement limited to the simple discovery of what actually exists. The chemistry of our time, bold in all its aims, has succeeded, through this same law of quantitative proportions, not solely in filling up, by the *creation of new compounds*, the gaps thus deserted, but even yet further, in producing, by the processes of the laboratory, numerous substances absolutely identical with organic compounds, hitherto known to us only as the products of animal or vegetable life. A vast step we must admit it to be; yet subject to the remark, that whereas nature works primarily with the simple or inorganic material elements, the chemist can only elaborate these "counterfeit presentments" from the dissolution and changes of organic compounds already in his hands. The difference here is greater than may appear at first sight; but there is no reason in theory why science should not eventually pass beyond the line and obliterate it.

While especially demonstrated in chemical force and affinities, the atomic theory is far from being limited in application to this single science. We have seen that the other great forces are known to us by their actions on and through matter,—such actions and changes, whether from light, heat, electricity, or dynamic force, giving foundation to the several physical sciences which bear these names. Correlated as they all are with chemical phenomena, we might expect some corresponding relation to that atomic constitution of bodies, from which modern chemistry has drawn its greatest discoveries. And accordingly we find numerous and striking proofs to this effect furnished by those who are seeking to solve experimentally these high problems, and thereby to establish new connexions in the sciences, and laws common to all. We might take, as a most instructive example, the various and beautiful phenomena of crystalline bodies in their relation to heat, light, and electricity. The crystal itself, whatever the matter composing it, must be regarded as a substance, the component molecules of which are compelled by a force or affinity (which we may *provisionally* call polarity) to assume certain definite positions, determining both the inner structure and outer form. The three forces just named all affect most curi-

ously this molecular arrangement. Mitscherlich has shown that while octædral crystals expand equally in all directions from heat, other crystals, not in this group, change the measure of their angles with every change of temperature. He has further shown that great alterations may be effected by heat in the internal structure of crystals (as in the case of certain prismatic crystals evolving octædrons under exposure to the sun's heat), without affecting their solidity or altering their external form.

This latter fact, now attested in various ways, that molecular changes, transient or permanent, may occur within bodies while retaining what we call their solid state, is one of high interest, and scarcely enough regarded in its various applications to every part of physics. The familiarity of some of the instances disguises what is most curious and important in the inferences from them. The simple expansion of a metallic bar by heat involves an atomic change through its every part; less complex it may be than those changes of molecular arrangement within crystals, however produced, which affect the passage of light through them; but analogous in the main fact of the mobility of atoms, and their power of assuming new and definite position within a solid body. We know from recent experiments that an iron bar is sensibly elongated; and the elasticity of iron transiently, of steel permanently, altered by magnetization. We know further that the capacity of iron to conduct heat is variously modified under the electro-magnetic action. We have the certainty, from the effects manifested at its extremities, that every molecule in the wire of an electric telegraph, whatever its length, undergoes change at the moments of transmission or cessation of the electric force. Without stopping to inquire whether such changes may or may not be interpreted as a *tendency* to what we term fluidity, we clearly see in them a proof of the *individuality* of atoms; and very strong evidence that these molecules of matter, minute beyond conception though they be, are endowed individually with axes of motion or polarities, determining their mutual relations, and the changes they undergo when submitted to forces from without. Such conclusions, forced upon us by the simplest view of the subject, are strikingly corroborated by the whole course of modern inquiry: and very especially in those

sciences to which the actions of light, and of electricity or magnetism, upon matter give foundation. We might in truth affirm that the highest speculations and most arduous questions and researches in modern physics concentrate themselves upon this point. The most eminent discoveries of our own day involve these qualities and conditions of the elementary molecules of matter; while the number of problems yet unsolved render this the most fertile and capacious field for future labor. The time may come when molecular forces or affinities, now represented chiefly in chemical actions, may be reduced to a common principle with what we term *mechanical forces*. And if gravitation be ever submitted to some common law with other powers, such law will probably be founded on the nature and functions of these ultimate particles—the *σώματα ἀδιάσπιστα* of ancient philosophy—the elements through which modern science works amidst the most profound mysteries of the natural world.

Our limits prohibit any details as to those numerous discoveries which illustrate this particular inquiry, or the more general progress of those sciences of optics, heat, and electricity which so variously and wonderfully interpret the relations of matter to the forces acting through or upon it. Some of these discoveries, simple and limited in their origin, have become volumes of new knowledge in their progress. Such are, for instance, the discovery of Oersted, on which depends the whole science of electro-magnetism;—the doctrine of electrolysis, as established by Faraday in strict fulfilment of the law of definite proportions and equivalents;—the still greater discovery of Faraday, that all matter, whatsoever its nature, solid, fluid, or gaseous, is affected in a determinate manner when placed within the sphere or lines of magnetic force;—the contemporaneous discovery by the same philosopher of the rotation of a beam of polarised light under the influence of magnetic force directed through glass of a certain texture, followed by those larger researches which establish relations between magnetic force and the intimate structure of crystalline bodies;—the whole science and exquisite art of photography; and the beautiful and still more recent experiments of Grove and Neipce, founded upon it, showing the direct action of light upon the molecules of matter to be far more universal, as well as

more definite and lasting, than was before dreamt of in our philosophy;—and the discovery of *allotropic states* in various substances, as phosphorus, oxygen, &c., where (as in the earlier instance of the diamond and carbon) a total change of physical properties is produced, the matter so changed retaining its exact identity of nature.

We name these few instances out of many equally remarkable; all expounding, in one form or other, the great principle of molecular action and relation, to the clear conception of which modern science owes so much of its success. Even the points still open to controversy,—such as the true nature of the distinction between pure magnetic and diamagnetic bodies, those which take position parallel to the line of magnetic force, or transversely to it,—are clearly seen to depend for solution on more exact knowledge of the modes of molecular aggregation, and their influence on the forces which traverse them. Again, we have the question, before noticed, as to the phenomena of electrical induction through air, glass, and other media—whether these are due to some unknown physical causes? or to molecular polarities and motions, far removed from all cognisance of the senses, but interpreted to our reason by the closest experimental analogies? Faraday has given the sanction of his opinion to this molecular view of the phenomena; and Grove has done much to strengthen and extend this important conclusion.

We have hitherto been speaking of matter generally, without regard to the various aspects under which it is known to us. For with all the refinements of modern analysis, there still remain about sixty substances *undecomposed*, and which must therefore be deemed simple or elementary to our present knowledge. Of these the largest proportion are what we term metallic bodies, and most of the additions recently made to the list of simple substances belong to this class; with the further curious specialty pertaining to several of them, that while perfectly distinct from all others in physical characters, they are hitherto known to exist in a few rare specimens only. Almost we might be tempted to surmise that they belong to the number of those materials of which *aërolites* seem to tell us that other worlds are made; and that they are present there much more largely than in the feeble representation of their ex-

istence on our own globe. Such suggestion, however, must be received simply as illustrating the manner in which modern science attaches facts already attained to problems yet unresolved; concentrating them as it were around common *foci*, towards which they ever more closely converge.

The great problem regarding these many modes or kinds of matter on our earth lies in the question, whether and how they may be lessened in number by reduction to certain elements, common to several or all? Whether, in other words, bodies simple to our present knowledge are actually compound in their nature? Chemistry, it must be owned, has hitherto done little directly towards solving this question; the vast resources of analysis having tended to multiply elements upon us rather than to abridge their number. Some approach in this direction has, however, been made through the law of isomorphism; which, in showing relations of mutual substitution between certain elementary bodies, having other curious resemblance of physical properties, has led to their arrangement in groups; preparatory, it may be hoped, to some future discovery which will give a common basis to all the bodies thus related. The most remarkable of these groups is that comprising chlorine, iodine, and bromine. Arsenic and phosphorus, selenium and sulphur, are other examples of these combinations; to all which, in connexion with the law of definite proportions, the labors of the chemist are sedulously directed; not solely for instant results, but with the prospect continually before him of those higher truths, to which some one single discovery may perchance open the way. The present methods of chemical inquiry are peculiarly fitted to this *critical examination* of the simple bodies. Electricity, equally powerful and delicate as an instrument of analysis, has been, and must ever be, an especial aid—probably the most effective of all—in the prosecution of an object worthy of all the labor and genius that can be given to its attainment.

Oxygen, hydrogen, and nitrogen are the three elements which furnish what we may fairly call the *crucial problem* in this part of science. Embodying themselves with all other forms of matter by the most complex affinities, and in compounds of infinite variety, no art or force has yet succeeded in showing them to us singly otherwise than in the gaseous form.

The powers of analysis, whether chemical or electrolytic, utterly fail when put to trial upon them. A recent discovery, indeed, has shown us oxygen under the new or allotropic form of ozone; but no analogous transformation has hitherto been effected on the two kindred elements. Mighty though the power and efficiency of this one is in every part of the natural world, we must avow a still deeper interest in the scientific fortunes of nitrogen, and a belief that it is fated to disclose still more to future discovery. Its history down to the present time has been one of paradox throughout. Known as a simple gas chiefly by its negative qualities, and in this state capable of direct union with only one or two bodies (as titanium and boron), nitrogen shows itself in combinations, otherwise effected, as one of the most strange and powerful elements with which chemistry has made us acquainted. We inhale it largely with every breath, seemingly but as a diluent to the oxygen, with which it is mixed in our atmosphere. We take it into the system as a constituent of food, and find it forming an integral and essential part of the animal textures; while to compounds differing but in slight proportion of their elements, it imparts the character of the most virulent poisons. These incongruities, which might seem to render research more difficult, do in truth afford more ample materials and room for discovery. Certain approaches have already been made in this direction of inquiry; and we should wrong the spirit and resources of modern science were we to doubt its reaching yet much nearer towards the ultimate truth.

In passing thus cursorily over the sciences which deal with the various forms of matter in our globe, and the forces affecting them, we have said nothing of that science now become so vast in its objects and methods, which takes as its province the outer structure of the globe itself; and the changes, organic as well as merely material, succeeding one another for ages on that surface which is now the dwelling place of man. Such seeming

omission we may explain by reference to a previous article in this Number,* in which the present aspect of geological science, and the questions it involves, have been considered at some length. We may remark further that Geology has (within the last thirty years more especially) undergone a change which raises it far above the mere history of the location or dislocation of the strata, and connects it inseparably with other branches of science still more fruitful of discovery. Fossil Geology, the creation of our own time, is allied in every part with the history and physiology of animal and vegetable life;—that great domain of knowledge which, though closely encircled round by physical laws and phenomena, and approached only through these, has still secret region within, the law and principle of life, hitherto inaccessible by any method of human inquiry. It was our original design to have included this latter subject in the present article; as illustrating, not less than other branches of science, the advances made in actual knowledge, and the spirit which impels and animates to further research. While admitting that this spirit has sometimes run riot upon questions the very mystery of which invites and emboldens speculation, we find true inductive science moving steadily onwards, amidst these more erratic courses, to those truths—the *κρίμα ἐς αἰεί*—which are the certain reward of all legitimate inquiry. So much, however, has recently been attained in animal and vegetable physiology, that not even the briefest summary could bring it within our present limits; and we must postpone till some future occasion, if such should occur, our notice of these eminent discoveries, and of the works which best describe and illustrate them. What we have just drawn from other branches of physical science will, we trust, adequately fulfil our intention of showing in what spirit such science has been recently pursued; and with what signal success in compassing and expounding the great phenomena of the natural world.

* On Hugh Miller—See Living Age No. 743.

A YOUNG LADY'S DESCRIPTION OF A STORM AT SEA.—The sun went down like a ball of dull fire, in the midst of smearing clouds of red-currant jam. The wind began to whistle worse than any of the lowest orders of society in a shilling gallery. Every wave was suddenly as

big and high as Primrose Hill. The cords of the ship snapped like bad stay-laces. No best Genoa velvet was ever blacker than the firmament, and not even the voices of the ladies calling for the stewardess were heard above the orchestral crashing of the elements.—*Jerrold.*

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From THE NATIONAL MAGAZINE.
JOHN FOSTER.*

It seems to be one of the prerogatives of genius not only to perpetuate its productions through successive ages, and in them, as a soil, to propagate itself as a sort of seminal element, but also, more or less, to permeate society incessantly, though often with an influence scarcely perceptible during the progress of its operation. That influence, too, is by no means confined to cognate minds,—either to those who possess the rare endowment, or to that larger class who occupy a disputable and yet an envied border-land within sight of the enchanted region. Genius is contagious even to the unendowed. They are moulded by it unconsciously, and experience elevating emotions of admiration and even of sympathy which they are altogether unable to define or to investigate. Indeed genius, as an intensification of one or more of those mental faculties which are possessed in common by mankind, appeals to a universal sense, and leads men captive less by the attraction of superior bulk than by the more subtle influence of an indefeasible affinity. The inhabitants of the cities which disputed the honor of having given birth to Homer, could not doubtless, if they had clubbed their wits, have produced the *Iliad*; but the contest, if it ever existed, was, we may suppose, thoroughly earnest, and must moreover have been sustained by causes which lay far below the stratum of mere provincial vanity. "One touch of nature makes the whole world kin;" and even a clown in the gallery will be beguiled of a tear over the sublime sorrows of *Ulysses*. Even the philosophic poet, whom (though with many critical exceptions) we are inclined to designate as the Alexander Pope of classical antiquity, does not hesitate to endorse one of his *dicta* with the explanation:

"Non meus hic sermo, sed quæ præcepit Ofellus
Rusticus, abnormis, sapiens, crassaque Minerva."

There is no such thing as an aristocracy in the intellectual world. "The republic of letters" is a true designation. Nature, has, indeed, her aristocracy; but it is neither constitutional nor exclusive: it boasts no her-

* *Fosteriana*: consisting of *Thoughts, Reflections, and Criticisms of John Foster, Author of "Essays on Decision of Character, Popular Ignorance," &c.* Selected from Periodical Papers, not hitherto published in a collective form. London: H. G. Bohn, 1858.

aldry, and it knows no pedigree; all earnest thinkers are the candidates, and the world ennobles by the right of a sovereign authority.

Indeed, the universality of the appeal of genius may be illustrated by that of the imitative arts. As all men of deep thought and feeling are the judges of the one, so are all close and patient observers of the other. Apelles did not disdain to be instructed by a cobbler; and there is something suggestive in the criticism of the rustic who was gazing at a well-known painting of pigs feeding: "That man knew nothing about pigs. When did you ever see a lot feeding together but one of 'em had his foot in the trough?" Both the author and the artist appeal with right and reason to the judgment of those who can criticise what they cannot perform, and who can heartily admire what they are unable to imitate.

But the potentate that most exalts and perpetuates the honors of genius is Death. No sooner has that power terminated for ever the instructions and the enchantments of genius, than the world awakes to a sense of the value of what it has lost. Monuments arise to mark the scene of a biographical incident; the discovery of a literary fragment outweighs in interest that of a new orb in the solar system; and even an authentic autograph will make wise men mad. It is this, as Cicero says, that attaches an interest so universal to the places that have been haunted by the departed great; and it is this which leads mankind, as in the case before us, when genius can no longer reward them with a nugget, to wash and sift and triturate its dust and *debris*. Just so we give more pains and palisading to ruins to preserve them from destruction, than we do to palaces and temples to protect them from injury and decay.

We have said that we owe to this universal feeling the gleanings before us from the more fugitive writings of the late John Foster. And now we can imagine that not a few readers, and those not deficient in literary culture, will exclaim, "And who was *he*?"—so true it is that the only men well known to the bulk of society are men of action. Yet these are not the real movers in the great changes that pass upon the world. With all their marvellous energy, they are but the operatives under the men of thought. So men travel admiringly half over the world by steam who never heard of Watt and Stephenson, and

many have witnessed the battles that decided the fate of empires without having caught a glimpse of the commander-in-chief. The invisible Nemesis which hovered behind the hosts of Naseby field, and swayed the fortunes of that direful day, was not delegated from the palace of a king, nor from the chamber of a senate, but evoked by the thought of a people informed and embodied into life by an open Scripture. No march of armies ever produced a greater social result than the barefoot pilgrimage of Ignatius Loyola; and the great ecclesiastical revolution to which her Majesty owes her crown, and this country three-fourths of all that makes it worth while to be a Briton, was brought about by "the solitary monk that shook the world." So too the chivalry of Spain vanished before the laughter that issued from the cell of Cervantes; and no extrinsic and material powers have ever moved society as it has been moved by those "thoughts that wander through eternity" which escaped from dungeons where men of whom the world was not worthy, by the majesty of their endurance, have "led captivity captive." Thinkers rule the ages; and all that the conquerors and statesmen who have lived since the Christian era have done towards making the civilised world the "theatre of wonders" which it now is, is nothing comparable to the founding of the inductive philosophy, which was systematised by a lawyer in a chamber in Gray's Inn.

It is, then, to the class of thinkers that John Foster preëminently belonged. Foster is (for why should we say *was*?) a great intellectual instructor. The reader must not expect the faintest biographical sketch of this remarkable man; for it may be said of him (as he once said to the writer respecting his friend Coleridge) that he never *had* a biography. He was a recluse man—we had almost said an anchorite—who lived between the dates 1770 and 1840. He was a Dissenter, and in early life entered the Christian ministry. During the principal part of his life, however, he had no regular charge; his ministerial labors having been limited to a weekly lecture delivered in Bristol, and to occasional services held in village-chapels and private houses. Some of the lectures referred to have been published from his manuscript notes; but none, we believe, under his own supervision. Of the latter and more private

services we know nothing save by few and faint traditions. Comparing these, however, with our own recollections of his conversations, we can imagine that what the privileged few must have heard was as profound as Butler, and scarcely less original than the first chapter of Genesis. One sermon—and, as we believe, one only—he published. This was preached in the defence and advocacy of Christian missions; and if any of our readers should be tempted to peruse it, we promise them that they will see some meaning in a criticism upon it addressed to us by one who heard it,—“that it should have been preached to an auditory *created for the purpose*.”

The literary world acknowledges great obligations to the ladies; but it owes them far more than it supposes, and doubtless far more than can ever be disclosed. When Foster sought the hand of the lady whom he eventually married, she expressed her unwillingness to ally herself to any one who had not distinguished himself in literature. Upon this he addressed to her, in a series of letters, the work which, under the title of *Foster's Essays*, is now known wherever the English language is spoken or read. This latter statement, however, requires a very serious limitation. They are known, not to the reading, but only to the thinking world; and a brief description of them, necessarily avoiding any thing approaching to criticism, will probably afford information to very many who may read these lines. The Essays are four in number: the first is entitled “On a Man's writing Memoirs of Himself;” the second, “On Decision of Character;” the third, “On the Application of the Epithet Romantic;” and the fourth, “On some of the Causes of the Aversion of Men of Taste to Evangelical Religion.” The finest criticism on these is the review of them which will be found in the collected writings of the late Rev. Robert Hall; a tribute which was pensively but nobly repaid by Foster in his treatise “On the Character of Hall as a Theologian and a Preacher;” which will be found in the sixth volume of Hall's works, edited by the late Dr. Olinthus Gregory.

Of the essays, the second, on “Decision of Character,” has ever been the most popular. The first, however, is by far the most characteristic, as being unquestionably the most original; while the last is perhaps, on the whole, the most practically valuable. Of it it

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may well be said to the preachers, and especially to the popular preachers, of the present day,

"Nocturnâ versate manu, versate diurnâ."

If they would but saturate their minds with the sentiments of this noble essay, the advance of the success of the pulpit would cease to be impeded by some of its greatest obstacles,—professional egotism, effeminate sentimentality, coarse familiarity, theatrical attitudinising, self-admiring pauses, and theological slang. All else that Mr. Foster has left to posterity is his essay "On Popular Ignorance," which fills a large octavo volume; an Introduction to Doddridge's *Rise and Progress of Religion in the Soul*; and his *Diary and Letters and Literary Fragments*, published in two volumes octavo, under the judicious and singularly modest editorship of Jonathan Ryland. Foster was also for many years an almost constant contributor to the *Eclectic Review*. A selection from these critical Essays has been published, in two volumes octavo; and the work before us is made up of the gleanings from those contributions too fragmentary to be suited to the larger work.

Of this volume it is unnecessary to say one word; but we hail its appearance because it affords an opportunity of directing the attention of the public to the writings of John Foster. In knowledge of human nature we should almost class Foster with Shakspeare. He sounds the most secret depths of human experience, touches the most delicate springs of human motive and feeling, stimulates to germination the nascent buds of fancy, and unlocks the most secret apartments of conscience and feeling; he plays upon a congenial mind like a master upon an instrument of his own creation, now awakening the diapason of profoundest thought, while anon he "opes the sacred source of sympathetic tears." It is true that his writings are a study; but it is equally true that there is not a faculty nor an emotion of the human mind, whether active or dormant, which they do not either nourish into efflorescence or stimulate to vitality. It is also true that the massiveness of his thought gives to his sentences what to a superficial observation might appear an impenetrable solidity of meaning; but this should only supply a stimulus to investigation and reflection. Foster was infinitely removed from the pedantry and the feebleness of mysticism; the student digs through a few

feet of genial soil and finds the virgin ore. He once told the writer that it had taken him half an hour to frame a single sentence to the satisfaction of his fastidious taste; but this fact is obviously dependent upon the profundity and the originality of his conceptions, and the consequent difficulty of presenting them to others in the same point of view which he himself occupied. The construction of his sentences is a marvel of ingenuity; and we have been told by a minute scholar that nothing could be more interesting than the explanations elicited from him of the emendations made in—we think—the ninth edition of his *Essays* upon the merely verbal structure of the former editions.

It is no condemnation of Foster's *Essays* to say that they are a study; for it is one in which the student finds a present reward. Hall says, in the review to which we have alluded, that Foster travelled into those remote and untrodden regions of thought in which light glanced from an angle only, without diffusing itself over the whole. He might have added that he presented those masses of thought, of which one phase only can be observed at a time, but in rounding which the adventurer finds iridescent snows on the one side and wild fruits and flowers on the other. It is for the rising and the thinking youth of this country, the staple of future generations, to study the writings of this extraordinary man; and in doing so, to bear in mind that they are entering on no trifling pursuit. A single perusal will be of slight avail in reading Foster; they must drink deep or taste not; and in entering upon the study they should solemnly embrace a conviction which the present conditions of society are well calculated to extinguish. All its tendencies are outwards, and point to material greatness and magnificent display. Greatly as education has advanced during the present generation, these appear to be the principal tendencies of the advance; and to these the external conditions of society, viewed in their most extended aspect, have greatly contributed. Multitudes fly to ransack the Antipodes for gold; and at home, owing to the marvellous discoveries of science, and to the consequent stimulus of enterprise, we can imagine that posterity will designate this as "the monster age." We build ships which would export the population of a provincial town, and palace of glass which would shelter the in

habitants of our largest cities; we have monster concerts, monster oratories, monster religious congregations,—in a word, every thing cultivated by a forcing process except the inner life.

Surely this is the appropriate time for inviting attention to the writings of a man who, if his varied attributes could be designated by a single term, would be emphatically described as *reflective*. But they are such as have no specific relation to any age or to any social condition. Those who will devote their time to the study of them will not find themselves instructed on any special subject, but will find that they are being taught to think, and becoming possessed of a master-key which will admit them to all the chambers of imagery, and to all the apartments and domains of human speculation. They will find the loftiness of Milton presented in the flexible and

copious phraseology with which time and refinement have enriched our language. They will find the wisdom and solidity of Johnson without his notional exclusiveness, and all the cloud-land of Coleridge's remote speculation cleared of his mysticism, and mapped and outlined with an intellectual and logical precision. However select may be his school in the present generation, and however slowly the rule of his great genius may extend, we venture to predict that in distant days he will be teaching mankind; and that "John Foster" will be a household word though every pinch of dust in our imperial mausoleums may have parted for ever with its name. Evermore the present is the epoch of power, the future of thought—the present of the sceptre, the future of the pen. Princes are consigned to chronology, but thinkers are made over to time.

No aboriginal race has ever yet come directly in contact with Anglo-Saxons, except to its moral and physical ruin. Whenever such a race has been saved from destruction, it has been through the interposition of some powerful corporate body, whose guiding policy was not simply selfish. The English religious societies, by their emissaries at the Cape, in the South Sea Islands and in New Zealand, have preserved the aborigines from oppression, enslavement, or massacre, at the hands of colonists and adventurers of our own blood. But for the London Missionary Society, the Church Missionary Society, and the Society for the Propagation of the Gospel, the Hottentot, the South Sea Islander, and the Maori would have been as clean swept from the earth as the Pequod or the Narragansett. What the religious societies have been to ignorant fetish-worshipping barbarians, the East India Company has been to the Hindoo—the creature of the false civilization, false knowledge, and false faith of centuries. A sphere too vast and an undertaking too difficult for bodies which, with all their excellences, cannot boast of their statesmanship or pride themselves on a varied familiarity with human nature, devolved on a great association which wedded policy to energy, and which to the virtues of single-mindedness and benevolence added those of tolerance and charity. No more grotesque injustice was ever committed than by Mr. Bright and Mr. Drummond, when they impliedly taxed the representatives of the Company with insulting and oppressing the natives. Practices of insult and oppression are normal in India among the class of gentlemen who give the sort of evidence on native character which may be seen in the new Blue-book on Colonization. We fear, too, that they have become only too common among military men of both armies.

But nobody can breathe the air of India for three weeks without realizing the absurdity of fastening such charges on the civil servants of the Company. If their enemies in England have accused them of ill-treating the Hindoo, it must be in the same spirit of humorous calumny in which an American novelist asserts that he saw the wife of a missionary drawn to church in Tahiti by a team of four Christian converts harnessed to a wheel-chair. When these matters are seriously ventilated in England, it will be found that the civil servants stand between the Hindoo and his European oppressors as distinctly as did Las Casas and his monks between the colonists of the Spanish Indies and the unfortunate race which they were grinding into powder.—*Saturday Review*.

It has become a common and not very creditable practice to put up horses at auctions for sale "without reserve," and then for the owner to buy them in unless the bids rise to a certain point. The practice has been much commented upon, and the question has been raised whether a horse, so advertised for sale, cannot be claimed by the highest *bonâ fide* bidder. Captain Warlow attended a sale at Birmingham of horses that were to be sold without reserve. He selected one and bid for him. The owner of the horse bid higher, and the hammer descended. Captain Warlow, finding that the owner was the purchaser, tendered his bidding, and demanded the horse. As it was not given up he brought an action against the auctioneer. It was tried at the Warwick Assizes, and Lord Chief Justice Cockburn decided against the defendant, but gave him liberty to move upon all the points of law he had raised. It is time some check should be put to a practice so discreditable.

From Blackwood's Magazine.

RESPIRATION AND SUFFOCATION.

A YOUNG man, in all the vigor of abounding life, shuts himself up in his room, prevents the access of fresh air, closing the windows, chimney, and chimks, lights a pan of charcoal, and seating himself at his writing-desk, begins to unburthen his heart of its sorrow, in the tragic eloquence of one for whom such sorrow is insupportable. The poor boy has been refused the hand of the girl he loves, and believing that without her life would be worthless, he has resolved on suicide. As his pen hurries over the paper, the vapor from the burning charcoal fills the room. His pulses throb, his head is hot, his breathing oppressed. The candle is beginning to burn dimly, and its flame lengthens. He is unable to continue. He walks languidly up and down the room, and finally crawls to the bed. Life slowly ebbs. On the following morning, when his door is burst open, a corpse is stretched upon the bed.

A few hours later, she whom he loved, and who loves him, hears of this rash act, which annihilates even hope. In her despair she flings herself into the dark and sullen Seine. The next morning a corpse is exposed at the dreadful Morgue. The casual spectator gazes on it with undefinable awe, as he thinks of the stillness of that wondrous organism, which but a few hours before was so buoyant with life. Where is all that mystery now? The body is there, the form is there, the wondrous structure is there, but where is its activity? Gone are the graceful movements of those limbs, and the tender sweetness of those eyes; gone the rosy glow of youth, and the soft eagerness of womanly grace; gone the music of that voice, and the gaiety of that heart. The mystery of Life has given place to the mystery of Death.

What has thus suddenly arrested the wondrous mechanism, and, in the place of two palpitating, vigorous beings, left two silent corpses? The cause seems so trifling that we can only marvel at its importance, when revealed in the effect; it was the same in both cases, in spite of the difference of the means: that which killed the one killed the other; the fumes from the charcoal pan, and the rushing waters of the Seine, interrupted the exchange of a small quantity of gases, and by preventing the blood from getting rid of its carbonic acid, in exchange for an equiv-

alent of oxygen, the fervid wheels of life were suddenly arrested. It is the same cause acting with milder force, which makes the faces pale of those who issue from a crowded church, and gives a languor to those who have sat for some hours in a theatre, concert-room, or any other ill-ventilated apartment, in which human beings have been exhaling carbonic acid from their lungs. A breath of fresh air quickly restores them, and after breathing this fresh air, during a walk home, they scarcely feel any evil results of the late partial suffocation. Had the young man's door been burst open, and fresh air admitted to his room, or had the girl been rescued from the river, and made to breathe within a few minutes after her plunge, both would have been finally restored, as our concert-goers are restored; and the concert-goers, if kept much longer in that ill-ventilated room, would have perished, as the lovers perished.

Among the earliest experiences of mankind must have been the necessity of fresh air for the continuance of life; but the complete explanation of the fact, in all its details is a scientific problem, the solution of which only began to be possible when Priestley discovered the gases of which the air is composed, and the relation these bear to the organism; nor is the problem even now entirely solved, in spite of the labors of so many illustrious men. We have learned much, and learned it accurately; but the difficulties which still baffle us are many and considerable. The ancients really knew nothing of this subject; nor did the men of the sixteenth and seventeenth centuries lay any solid foundation-stone. That was laid by Priestley, when he discovered the oxygen contained in atmospheric air to possess the property of converting venous into arterial blood. Lavoisier carried out this discovery, and founded the chemical theory of Respiration. Goodwyn (1788) applied the new views to Asphyxia, showing, by a series of experiments, that when air was excluded, venous blood remained unchanged, and when it remained unchanged, death inevitably followed. Bichat instituted a number of striking experiments to prove that an intimate relation existed between Respiration, Circulation, and Nervous Action; he showed how the access of venous blood to the brain stopped its action, and subsequently stopped the action of the heart. Legallois extended these observations to the spinal chord.

But by far the most brilliant investigations on the subject of Respiration, are those of Spallanzani, whose *Mémoires* still deserve a careful study, both as models of scientific research, and as storehouses of valuable facts. He was succeeded by W. F. Edwards, whose *Influence des Agens Physiques sur la Vie* (which may be found on the old book-stalls for a couple of shillings) still remains one of the best books the science can boast of. During the present century, hundreds of physiologists have devoted labor to the elucidation of the various difficulties which darken this subject, and a vast accession of valuable facts has been the result. The chief points which have been cleared up we may now endeavor to exhibit.*

And first, let us ask, What is Respiration?—a question which many may regard as idle; yet, until it is answered in something like a definite manner, we shall find our inquiries constantly obstructed. Reduced to its simplest elements, Respiration appears to be nothing more than the interchange between the blood and the atmosphere of carbonic acid and oxygen; but although this is the simple formula to which analysis of the process conducts us, we shall be led into important errors if we see in it the whole of the process. It is the *physical fact* upon which the vital process depends, but it is not the *vital function* itself. This interchange is effected by every tissue—even when separated from the organism. They all absorb oxygen, and exhale carbonic acid. A fragment of muscle, so long as it retains its irritability, is found to absorb oxygen from the air, and to exhale carbonic acid; but we do not call such interchange Respiration, because Respiration is something more than a mere exchange of gases, it is an animal Function, which, although dependent on the physical laws of gaseous interchange, derives its special character from the organism in which it is effected. In the course of our inquiry we shall have occasion to observe how the neglect of the distinction now insisted on, between Respiration as the Function of an ap-

paratus of organs, and Respiration as the mere interchange of gases, determined by physical laws, has led to error; for the present, it is enough to have drawn attention to the true physiological conception. In the higher animals we see this Function performed by two different organs—gills and lungs. In both organs we find that a large quantity of blood is exposed to the air by means of a network of vessels spread over the surface. The blood arrives there black, and passes away scarlet. It has exchanged some of its carbonic acid for some of the oxygen of the air; it has become changed from venous into arterial blood. This oxygenation of the blood is therefore the special office of Respiration; and although all animals exhale carbonic acid and absorb oxygen—although every tissue does so—yet we must rigorously limit the idea of Respiration, as an animal Function, to that which takes place in the gills or lungs. True it is, that the simpler animals effect such exhalation and absorption by their *general surface*, and not by any *special modification of it*—such as gills or lungs; true it is, that even fish and reptiles, furnished with gills, also respire by their skin; and that, when the lungs of a frog are removed, the necessary oxygenation of the blood may be effected through the skin, if the temperature be low; nay, it is also true that even man himself, in a slight degree, respire by the skin; so that the student tracing upwards the gradual complication of the organic apparatus, and finding, *first*, the whole of the general surface effecting the aeration needed; *secondly*, a part of the surface formed into a gill, in which aeration is far more active; and, *finally*, finding this gill replaced by a lung, may be tempted to say, "If the aeration of the blood is the office of Respiration, and if this is effected in some animals by the skin alone, in others by the skin and the gills, and in others principally by the lungs, but still in a slight degree also by the skin, how can you pretend to establish a distinction, other than a simple distinction of degree; how can you expect me to lay much stress on a verbal difference such as that between Function and general Property or Tissue?"

In reply to this plausible objection, we must observe that in science verbal distinctions are often extremely important; they keep attention alive to real, though subtle, distinctions.

* In the following works will be found most of the facts cited or alluded to in our exposition:—Spallanzani: *Mémoires sur la Respiration*; Edwards: *De l'Influence des Agens physiques sur la Vie*; Claude Bernard: *Leçons sur les Effets des Substances toxiques*; Milne Edwards: *Leçons sur la Phys. et l'Anat. Comp.*; Lehmann: *Physiologische Chemie*; and the Treatises on Physiology of Bérard, Funke, Müller, Draper, &c.

It is difficult to keep to such distinctions, for, as Bacon says, "words are generally framed and applied according to the conception of the vulgar, and draw lines of separation according to such differences as the vulgar can follow; and when a more acute intellect, or a more diligent observation, tries to introduce a better distinction, words rebel." In strict physiological language, no animal without blood ought to be said to *breathe*; for Respiration in such animals is not effected by a special apparatus of breathing organs; and in physiology the *idea of Function is inseparably connected with that of Organ*, as the Act is with its Agent. Professor Bérard says that, penetrated with the idea of a special organ being necessary for Respiration, he experienced a singular disappointment in reading the experiments of Spallanzani, which proved that every tissue of the body absorbed oxygen, and gave out carbonic acid; and he "only recovered his contentment on perceiving that the essence of Respiration consisted in this interchange of gases, so that, wherever a nutritive fluid was in contact with the atmosphere, Respiration must take place." Here the professor seems to us to have made an oversight, confounding the general with the particular, as completely as if a savage visiting England, and observing the transport of men and goods by railways, and "penetrated with the idea of a special method of transit being necessary," were afterwards to observe that vans, carts, and wheelbarrows also conveyed goods, from which he would conclude that the essence of transport being the removal of goods from one place to another, every means of transport must be a railway. The interchange of gases, like the transport of goods, may be effected by various means, but we only call the one Respiration when it is effected by gills or lungs, and the other Railway transit when it is effected by Railways. Professor Bérard was right in conceiving that a special organ was necessary for Respiration; and his error arose from confounding the *action of the organ* with the *result of that action*. Respiration effects the interchange of gases, and the aeration of the blood, by means of a peculiar organic apparatus, without which the due aeration would not take place in the higher animals. In the simpler animals this apparatus is not needed, because the nutritive fluid, being easily accessible, requires no function to bring it into

contact with the air; but no sooner does the organism become so complex that a direct aeration of the nutritive fluid ceases to be possible, than an apparatus is constructed, the function of which is to effect this aeration. In the gills and lungs we see such an apparatus. Unless distinctions like these are established, Respiration ceases altogether to be a vital process; and every interchange of carbonic acid and oxygen, no matter where effected, will have an equal claim to be designated as a respiratory act. Therefore, as it is of the first importance in all physiological inquiries to keep constantly in view the part played by the organism in modifying physical laws, the philosophic reader will see at once that any verbal distinction which aids us in this must be of advantage. We should perhaps, do well to indicate the special distinctions by using phrases, such as "pulmonary respiration," "bronchial respiration," and "cutaneous respiration," for the various classes of animals.

If now we ask, What is Respiration? the answer will be this: *The function of the lungs or gills, by means of which the blood absorbs oxygen, and parts with carbonic acid and some other noxious elements.* Oxygen is the great inciter of vital changes; its presence is the indispensable condition of life. It is at once fuel and flame: it feeds, and it destroys: constantly withdrawn from the blood, by the ceaseless activities of vital change, it is as constantly drawn into the blood by the process of Respiration. If the blood rushing through our lungs does not meet there with a supply of oxygen, the torrent carries venous in lieu of arterial blood to the tissues, and the consequence is an arrest of all the vital changes. If in passing through the lungs the blood only meets with a small supply of oxygen, an imperfectly arterialised fluid is carried to the tissues, and a partial arrest takes place, which is seen in the diminished vigor of the organism: all the functions are depressed; and if this depression continue, death arrives.

An organism and a medium—these are the two factors in the sum; yet, strangely enough, in trying to solve the problem of Respiration, men have principally directed their attention to one factor, the *medium*, forgetting the equally important influence of the organism. What is that medium? It is an atmospheric ocean forty-five miles in depth, whirling with

our planet, while that planet whirls round the sun, subject to incessant fluctuations, yet always preserving the same composition. This atmosphere is chiefly composed of two gases—oxygen, which forms about one-fifth, and nitrogen, which forms nearly the remaining four-fifths; to these must be added about 1-2000 of carbonic acid, and traces of ammonia. Such being the medium, let us now glance at the organism. Here there is nothing constant; not only are all animals different, and consequently their action on the atmosphere is different, but the same organism varies at different periods. As a general fact, the action of the animal organism may be succinctly stated to be the absorption of oxygen from the atmosphere, and the exhalation of carbonic acid into it. It matters not whether the animal lives in air or in water—the real respiratory medium is always the air—for water, deprived of its air, or of its due proportion of oxygen, is as fatal to marine as to terrestrial animals. It matters not by what organ or surface the respiratory exchange takes place, it is always a twofold act of exhalation of carbonic acid on the one hand, and of absorption of oxygen on the other. The variety of respiratory organs is great. In the Molluscs we find some kinds having no “organs” at all; some kinds having gills, others having lungs, and one kind (*Oncidium*) having both gills and lungs. In the Crustacea we find rudimentary gills. In spiders there are both gills and lungs. Fish have only gills. Frogs and Salamanders begin with gills, which disappear and give place to lungs. Reptiles, birds, and mammals, have lungs of different degrees of complexity. Cutaneous Respiration is effected when the air, either in the water or as atmospheric air, comes in contact with the moist skin in which the blood is circulating. Gill Respiration is effected in a similar way: the water, rushing over the delicate surface, parts with oxygen, and takes up carbonic acid. In Pulmonary Respiration the air is no longer outside, but inside the organ: it is drawn in from the atmosphere; the exchange is effected in the organ, and the altered air is then driven out, to be replaced by fresh air.

To understand the mechanism of Pulmonary Respiration, let us commence with an examination of the Newt (*Triton*), which presents us with the simplest form of the lung, and will therefore best enable us to understand the

more complex forms. On opening the chest of this Newt, recently caught from a neighboring pond, we observe two elongated air-sacs of thin membrane; these are the lungs. We remove one sac, and find an artery with its ramifications running down one side, and a vein running up the other. Into this sac the air enters by the windpipe; when there, it is in contact with the delicate blood-vessels lying in the membranous wall; the exchange of gases takes place; and the vitiated air is expelled by a contraction of the abdominal muscles; as you may see by observing the live animal in a glass vessel. The reptile's lung is thus an air-sac, on the surface of which blood-vessels are distributed; and if we now examine the lung of a man, we shall find that, in spite of its apparently different structure, it is little more than an almost endless repetition, on a smaller scale, of this very air-sac. The windpipe, instead of simply dividing into two branches, each branch terminated by a large air-sac, divides and subdivides like the branches and twigs of a tree, and these tubes are called the *bronchial tubes*; each tubelet terminates in a cell, forming, as Kölliker justly says, the miniature representation of the reptile's lung. The lung of a man is thus an aggregation of bronchial tubelets and air-sacs: these air-cells are very minute, sometimes the 200th of an inch, occasionally the 70th of an inch. Between these air-cells run the capillary blood-vessels. Thus each side of a blood-vessel is exposed to the air contained within a cell, and the gases pass to and fro through the delicate wall of the cells, and through the walls of the capillaries, with perfect facility. So crowded are the blood-vessels, that the diameter of the meshes formed by their network, is less than the 3000th of an inch, and the number of air-cells is calculated at not less than six hundred millions!

With this brief description of the organ, let us pass on to the function. When we breathe, we draw in the air by our nostrils, which penetrate the trachea, or windpipe, from thence passing into the bronchial tubes and tubelets, and from thence into the air-cells. Here it yields part of its oxygen to the blood, receiving carbonic acid in exchange. It was drawn in by a dilatation of the chest, and is driven out again by a contraction of the chest. Science has accurately measured the amount of air thus inspired and expired—

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namely, about 20 or 25 cubic inches each time. But we never empty our lungs by an expiration; there is always a much larger quantity of air remaining in the air-cells; this quantity varying, of course, with the force of the effort. Herbst found that, while 25 cubic inches was the quantity expelled in ordinary quiet breathing, the quantity would rise to 90, and even 240 cubic inches by very energetic efforts. It is therefore calculated that an adult man, with a well-developed chest, will retain about 170 cubic inches of air in his lungs, after each expiration, during ordinary breathing; and as 25 inches will be added at the next inspiration, there will be alternately 175 and 200 cubic inches of air acting on the blood which rushes over the vast area of the lungs. The phrase "vast area" is no exaggeration; for small as the bulk of those organs truly is, the amount of surface on which blood is exposed to the air in them, has been calculated by Lindenau at not less than 2642 square feet. Is it not wonderful to reflect that, in the course of a single year, 100,000 cubic feet of air have been drawn in and expelled, by something like 9,000,000 of separate and complicated actions of breathing, to aerate more than 3500 tons of blood?

The injurious effect of tight-lacing has often been pointed out, and in England, at least, women have pretty generally learned to see the danger, if not always the hideousness of those wasp-waists once so highly prized. A single fact elicited in the experiments of Herbst will probably have more weight than pages of eloquent exhortation. It is this: the same man who, when naked, was capable of inspiring 190 cubic inches at a breath, could only inspire 130 when dressed; now, if we compare the tightness of women's stays with the tightness of a man's dress, we shall easily form a conception of the serious obstacle stays must be to efficient breathing; and the injurious effect of this insufficient breathing consists, as we shall see hereafter, in its inducing a depression of all the vital functions.

In Respiration we draw in and give out a *similar quantity* of air; but this air is by no means of *similar quality*. It has been altered—vitiated. The ancients had no other notion of Respiration than that it served to cool the blood, as the air cools the heated brow. We know that it serves to supply the indispensable conditions of vital changes, by

removing carbonic acid from the blood, and supplying its place with oxygen. The air which is expired differs profoundly from that which was inspired: it has lost much of its oxygen, and has gained from 3 to 6 per cent of carbonic acid, a large amount of vapor, traces of ammonia, hydrogen, and volatile organic substances, with an increase of heat. It was pure respirable air when it entered, and is now so vitiated that after a few repetitions of the process it becomes irrespirable. The vitiation results from the carbonic acid. The quantity of this gas which is momentarily thrown into the atmosphere by each individual, varies according to sex, age, physical and mental condition, and according to the season of the year and time of day. We are constantly exhaling carbonic acid, but not in constant quantities. Men exhale much more than women; during the ages of from 16 to 40 the quantity exhaled by men nearly doubles that exhaled by women of the same ages. In men it is observed that the amount gradually increases from the age of 8 to that of 30, making a sudden start at the approach of puberty. From the age of 30 it decreases gradually, till at extreme old age the amount is no greater than it was at 10. In women a noticeable phenomenon is observed; the amount increases from infancy to puberty, just as in men; but at that epoch the increase suddenly ceases, and remains stationary till the change of life, when the amount increases. Besides such variations dependent on age and sex, there are others dependent on the muscular activity and physical condition of the individual. The amount of carbonic acid exhaled during digestion is greater than that exhaled during fast, and greater in sunlight than in darkness. Wines, spirits, tea, coffee, and narcotics lessen the amount; not, however, because they interfere with the process of Respiration, but because they cause less carbonic acid to be produced by the organism—they protect the tissues from the destructive action of oxygen.

The carbonic acid thus thrown into the air is the product of the disintegrated tissues—the ashes of the vital flame. The blood in the capillaries parts with its oxygen, received in the lungs, and, according to the current hypothesis, takes up in exchange the carbonic acid produced by the action of the tissues. If we were permitted to designate every interchange of these gases by the name of

Respiration, we should have to speak of two different kinds of Respiration, one taking place in the lungs, where carbonic acid is exchanged for oxygen, the other taking place in the tissues, where oxygen is exchanged for carbonic acid; but a more accurate and philosophical nomenclature, which seeks its terms in a consideration of functions, and not in the results effected by those functions, will not permit such confusion.

The exchange of these gases, considered simply as an exchange, is a physical fact resting on well-known physical laws. There have been, and there still are, disputes as to whether the gases are *free* in the blood, as in water, or are in a state of slight chemical combination; but the facility with which the exchange is made seems to be as great as if they were free. If blood be shaken in a vessel containing air, it will absorb more than a tenth of its volume of oxygen from that air. It is then saturated; and if now poured into a vessel containing carbonic acid, and there shaken, it will abandon almost all its oxygen, and absorb carbonic acid. This is a simple illustration of the interchange effected in the lungs and in the tissues; for, as previously indicated, the delicate walls of the blood-vessels oppose no obstacle to this interchange. It is only necessary that the blood should be brought in contact with an atmosphere, or a fluid, of a composition specifically different from our own; in the lungs the carbonised venous blood comes in contact with air containing scarcely any carbonic acid, in the tissues the oxygenised arterial blood comes in contact with a plasma which contains scarcely any oxygen, and in both cases the blood yields up its own gas in exchange for another. In the normal process the exchange is always that of *these* gases; but to prove the simple physical nature of the exchange, we have only to substitute hydrogen for oxygen, and the animal confined in a vessel containing this gas will be found to exhale carbonic acid with the same facility as when atmospheric air is breathed. No animal can continue long to breathe hydrogen, simply because that gas does not furnish the conditions of vitality; but while the animal breathes in hydrogen, the exhalation of carbonic acid is as perfect as at any other time: thus showing that the exhalation depends on the difference in the nature of the gases in the atmosphere, and in the blood.

When we breathe over and over again the same air, we gradually vitiate it by the constant exhalation of carbonic acid, which gradually brings the air up to the point where the difference between it and the blood—as regards the proportions of carbonic acid—disappears. The blood ceases to be arterialised, and the vital functions are arrested. In vain does the air still contain a quantity of life-giving oxygen; the blood cannot take it up, because it cannot get rid of the carbonic acid, and it cannot get rid of its carbonic acid because the conditions of the exchange are absent. To make an animal breathe air overcharged with carbonic acid, is equivalent to a gradual prevention of his breathing at all. Suffocation results from vitiated air in precisely the same manner as from interception of the air. Although burking and gagging are crimes which appal the public, that public seems almost indifferent to the milder form of the same murder when it is called “want of ventilation.” In spite of the historical infamy of the Black Hole at Calcutta, our prisons, hospitals, theatres, churches, and other public buildings, were left disgracefully neglected, until, thanks to the energetic labors of our sanitary reformers, public attention was aroused. That thousands have been the victims of public ignorance on this important matter, may be shown by a single example. The deaths of new-born infants between the ages of 1 and 15 days, which in the Dublin Lying-in Hospital amounted in the course of four years to 2944 out of 7650 births, were suddenly reduced to only 279 deaths during the same period, after a new system of ventilation had been adopted. Thus more than 2500 deaths, or 1 in every 3 births, must be attributed to the bad ventilation. In England the public is daily becoming more enlightened on the subject of ventilation, although a dangerous indifference, springing from want of elementary knowledge, is still prevalent, and taxes the patience of reformers; but in the country where these lines are written, it is painful to observe that even highly-cultivated men seem almost insensible to the importance of fresh air. The Germans sit for hours in low crowded rooms, so dense with tobacco-smoke that on entering you cannot recognise your friends; and so vitiated is the atmosphere by the compound of breath, bad tobacco, human exhalations, and an iron stove, that at first it seems impossible for you to

breathe in it. Even in their private rooms they breathe a hot, musty, *dry* air, which makes an Englishman gasp for an open window. It is true that after a while you get accustomed to the air. You also get accustomed to that of the smoke-filled tavern. On entering, you felt it would be impossible to stay there ten minutes; but in less than ten minutes it has become quite tolerable, and in half an hour scarcely appreciable. If you quit the room for a few minutes, and return once more after having breathed fresh air, again you perceive the poisonous condition of the atmosphere, but again you will get accustomed to it, and seem to breathe freely in it.

Was this atmosphere really not injurious? or have your sensations, like sentinels asleep, ceased to warn you of the danger? To answer this, we will first bring forward some experiments instituted by Claude Bernard, on the influence of vitiated air. A sparrow left in a bell-glass to breathe over and over again the same air, will live in it for upwards of three hours; but at the close of the second hour—when there is consequently still air of sufficient purity to permit *this* sparrow breathing it for more than an hour longer—if a fresh and vigorous sparrow be introduced, it will expire almost immediately. The air which would suffice for the respiration of one sparrow suffocates another. Nay more, if the sparrow be taken from the glass at the close of the third hour, when very feeble, it may be restored to activity; and no sooner has it recovered sufficient vigor to fly about again, than, if once more introduced into the atmosphere from which it was taken, it will perish immediately. Another experiment points to a similar result. A sparrow is confined in a bell-glass, and at the end of about an hour and a half it is still active, although obviously suffering; a second sparrow is introduced; in about ten minutes the new-comer is dead, while the original occupant flies about the lecture-room as soon as liberated.

One cannot try experiments on human beings as on animals, but accident and disease frequently furnish us with experiments made to our hand. What has been just related of the birds, is confirmed by an accident which befel two young Frenchwomen. They were in a room heated by a coke-stove. One of them was suffocated, and fell senseless on the ground. The other, who was in bed, suffer-

ing from typhoid fever, resisted the poisonous influence of the atmosphere, so as to be able to scream till assistance came. They were both rescued, but the healthy girl, who had succumbed to the noxious air, was found to have a paralysis of the left arm, which lasted for more than six months. Here, as in the case of the sparrows, we find the paradoxical result to be, that the poisonous action of a vitiated air is better resisted by the feeble, sickly organism, than by the vigorous, healthy organism. This paradox admits of a physiological explanation. In the vitiated air of a German *Kneipe*, as in that of the houses of the poor, we find those who have had time to adjust themselves to it, breathing without apparent inconvenience, although each new-comer feels the air to be vitiated; and because they "get accustomed to it," people very naturally suppose that no injurious effect can follow. Here lies the dangerous fallacy. They get accustomed to it, indeed, and only because they do so are they contented to remain in it; but at what price? by what means? By a gradual *depression of all the functions* of nutrition and secretion. In this depressed condition less oxygen is absorbed, and there is less needed in the atmosphere. A vitiated air will suffice for the respiration of a depressed organism, as it would amply suffice for the respiration of a cold-blooded animal. When we enter a vitiated atmosphere, our breathing becomes laborious; the consequence of this is a depression of all the organic functions, and then the breathing is easy again, because we no longer require so much oxygen, and we no longer produce so much carbonic acid. Were it not for this adjustment of the organism to the medium, by a gradual depression of the functions, continued existence in a vitiated atmosphere would be impossible; we see the vigorous bird perish instantaneously in air which would sustain the enfeebled bird for upwards of an hour. Thus does Physiology explain the paradox; but at the same time it points out the fallacy of supposing that bad air can be harmless because we "get accustomed" to it. However fortunate a circumstance for those who have to breathe bad air, that the organism is quickly depressed to such a point as to render such air respirable, no one will deny that depressions of this kind are necessarily injurious, especially when frequently experienced. There is indeed a wonderful elas-

ticity in the organism, enabling it to adapt itself to changing conditions; but a frequent depression of functional activity must be injurious, and fatal if prolonged.

It is interesting to observe the effect of a *gradual* adjustment of the organism, as contrasted with one less gradual. The longer the time allowed, the easier is this adjustment. Thus a bird will live three hours in a certain quantity of air; in the same quantity, two birds of the same species, age, and size, will *not* live one hour and a half, as might be supposed, but only one hour and a quarter. Conversely, the bird which will live only one hour in a pint of air, will live three hours in two pints.

Enlightened by these remarkable results, we shall now be able to regard Respiration as a physiological function rather than as a simple physical process. On more than one occasion we have had to protest against the tendency to explain vital phenomena by physical and chemical laws only, without regard to the order of conceptions specially belonging to vital phenomena; and we must repeat that protest in the present case. That Respiration is ultimately dependent on physical laws, no one thinks of disputing; and in the arduous endeavor to detect the operation of those laws, it is natural that men should neglect the still more difficult study of vital laws. But we think it can be shown that however far analysis may trace the operation of the laws of gaseous interchange and diffusion, and the condensing action of moist membranes, these will only conduct us to the threshold; they will never open for us the temple. These physical laws reveal only one part of the mystery. Respiration is not a simple physical fact. It is the function of a living organism, and as such receives a specific character from that organism. No sooner do we cease to regard the exclusively physical aspect of this function—no sooner do we fix our attention on the organism and *its* influence, than the whole theory we have raised on the laws of gaseous interchange suddenly totters and falls.

It seems easy to explain why warm-blooded animals cease to breathe in an atmosphere charged with a certain per-centage of carbonic acid, although there may still remain sufficient oxygen to permit a candle to burn in it, and even to permit continued respiration if the carbonic acid be removed. The

presence of a certain amount of carbonic acid in the air prevents the exhalation of that gas from the blood. As we read the explanation, nothing can seem clearer, and we admire the skill with which the laws of the absorption of gases are brought to bear on the fact. But as we pursue our researches, various difficulties arise; and as we extend the inquiry from the respiration of warm-blooded to that of cold-blooded animals, we learn that the fact so luminously explained is not at all true of the simpler organisms. Let us for a moment consider one striking contradiction in the theory; the air which has once passed through the lungs of a man, and which, in losing four or five per cent of its oxygen, has become charged with three or four per cent of carbonic acid, will yield but very little of its remaining oxygen when again passed through the lungs; and if this air be breathed over and over again, until the sense of suffocation forces a cessation, the air will still be found to contain ten per cent of oxygen—that is to say, nearly half its original quantity. In air thus vitiated the respiratory process is impossible, but only impossible for warm-blooded animals in health: frogs, reptiles, fish, and molluscs, instead of perishing when the air has lost about half its oxygen, continue to breathe, and to absorb oxygen, almost as long as there is any left. Spallanzani, Humboldt, and Matteucci, have placed this beyond a doubt by their experiments; and when we consider how long these experiments have been before the world, it is a matter of surprise that the contradiction they give to all the purely physical theories of Respiration has not been insisted on. If the process depends simply on the proportion of gasses in the atmosphere, how is it that one animal can continue to breathe in an atmosphere irrespirable by another? If it be simply the interchange of oxygen and carbonic acid, and this interchange be frustrated whenever eleven per cent of oxygen has disappeared, the law must be *absolute*, and as applicable to reptiles and molluscs as to birds or mammals. Instead of this, we find that reptiles can continue to breathe long after such a limit has been passed; they continue to absorb oxygen as long as even only three per cent remains, in spite of the continually increasing proportion of carbonic acid.

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of animals, and were powerless with another class? Why is it that, when a bird and a frog are confined in the same vessel, the frog will continue to absorb oxygen from the vitiated air in which the bird has long perished? Clearly the cause of this difference lies in the difference of the organisms; and we must no longer seek in the mere quantities of gases an explanation of interrupted respiration; we must no longer say that "breathing becomes impossible when the air is charged with a certain amount of carbonic acid, *because that amount prevents the gaseous interchange;*" but we must say that such an amount prevents the gaseous interchange, because it interferes with the organic action of the pulmonary apparatus. The distinction becomes palpable when we have an organism which is not affected by this amount of carbonic acid, and is even more palpable when we see a warm-blooded animal capable of breathing for a long period the air which, under a different condition, it would find irrespirable. We have seen how a bird, with its functions depressed, can continue to breathe for an hour in an atmosphere which immediately suffocated another bird of the same species; whereby it became clear that the lungs of one warm-blooded animal could absorb oxygen from an atmosphere in which there was such a proportion of carbonic acid, that sufficient oxygen could not be absorbed by a vigorous animal of the same species.

The intervention of organic conditions, modifying the simple physical laws of gaseous exchange, is sufficiently evident from what has just been said; but we have as yet no clear insight into the nature of this intervention; we do not know why blood, charged with carbonic acid, cannot in the one case exchange that gas for the oxygen, of which 10 per cent still remains, since in another case the same blood *can* effect the exchange when there is even less than 10 per cent of oxygen.

Atmospheric air contains only 21 per cent of oxygen. But if 50 per cent of oxygen be mixed with 50 of carbonic acid, a warm-blooded animal is suffocated in it, in spite of there being more than double the amount of oxygen there is in ordinary atmosphere. Bernard, who made the experiment, thinks that the carbonic acid in this mixture prevented the oxygen from entering the blood, not only because of its greater solubility, which gives it a tendency to displace the oxy-

gen, but also because of the obstacle it presents to the exhalation of carbonic acid. On the other hand, the extensive and careful experiments of Regnault and Reiset show that Respiration will take place quite well in an atmosphere which contains as much as 23 per cent of carbonic acid, if at the same time it contains as much as 40 per cent of oxygen. How are we, on physical principles, to reconcile such facts as those just cited? In the one case we see that 50 per cent of oxygen is insufficient if the amount of carbonic acid be also 50 per cent; in another case we see that 40 per cent of oxygen suffices if the carbonic acid do not exceed 23 per cent; and we could explain both by saying, that unless the amount of oxygen nearly doubles that of carbonic acid, respiration is impossible, were it not for the irresistible objection that reptiles breathe in an atmosphere which has become charged with carbonic acid, and has gradually lost all but 3 per cent of its oxygen.

We have raised difficulties which we cannot pretend to remove. It is enough to have called attention to the physiological problem involved, as a justification of our scepticism in presence of the physical explanations. Respiration is not a simple interchange of gases, but an organic function, which chiefly consists in exhaling carbonic acid and absorbing oxygen: whatever interferes with the exhalation or the absorption, checks Respiration, no matter what may be the condition of the atmosphere. As a final proof of the correctness of this conception, we will add that oxide of carbon, by preventing the exhalation of carbonic acid from the blood, prevents all Respiration, whatever amount of oxygen may be in the air. Moreover, experimenters are now agreed that there is no accurate correspondence between the amounts of oxygen absorbed and carbonic acid exhaled, as there ought to be were the process one of simple exchange. Spallanzani placed four couples of snails in four separate vessels containing atmospheric air; he found that two of these couples absorbed 20, one 19½, and the fourth only 17 of oxygen, but that the amount of carbonic acid exhaled was strikingly at variance. In two vessels he found 20 and 17 of oxygen replaced by 3 of carbonic acid; in two others, 20 and 19½ by 4 and 8 of carbonic acid; clearly showing that the exhalation had been one process, and the absorption another.

If we have gained some idea of Respiration, we shall be able to understand what Suffocation is, and why carbonic acid in the air is so injurious. Carbonic acid is not a poison, as was formerly maintained. Its accumulation in the blood is only fatal when there is such an accumulation in the atmosphere as prevents its exhalation; its mere presence seems to be quite harmless, even in large quantities, provided always that it be not retained there. Carbonic acid, when absorbed into the blood, which is alkaline, cannot there exert its irritant action as an acid, because it will either be transformed into a carbonate or be dissolved. Bernard has injected large quantities into the veins and arteries and under the skin of rabbits, and found no noxious effect ensue. The more carbonic acid there is in the blood, the more will be exhaled, provided always that the air be not already so charged with it as to prevent this exhalation.

Oxide of carbon seems, however, to be truly a poison. The blue flame which rises from the coals or lighted wood is this same oxide; the product of an imperfect combustion; and being notoriously poisonous, it has by some writers been selected as the real agent in those numerous deaths by asphyxia, occurring from voluntary and involuntary exposure to the fumes of charcoal in closed chambers. Carbonic acid was said to be innocent, and oxide of carbon had to bear the whole infamy. There is no doubt, however, that although carbonic acid is not a poison, it will produce asphyxia, and deaths from charcoal-fumes may occur either from this asphyxia or from poisoning by oxide of carbon, or from a conjunction of the two. Oxide of carbon is truly called a poison, because its action is deleterious even in slight doses, no matter what may be the state of the atmosphere; but carbonic acid is only deleterious when the quantity in the atmosphere is such that the absorption of oxygen is frustrated. But how does this oxide of carbon act? If venous blood be exposed to it, we see at once the change into scarlet blood take place. It acts on the blood like oxygen? you will ask. Not precisely; for if venous blood be exposed to oxygen it becomes scarlet, but when left to itself it becomes black again (except at the surface), probably because the oxygen has gradually formed carbonic acid. After exposure to oxide of carbon, the blood rema-

scarlet for days and days—nay, even for weeks, according to Bernard. Prussic acid acts in a similar manner. *Poisoning by prussic acid or oxide of carbon, may be detected by this scarlet color of the venous blood.*

The effect of oxide of carbon is to render the blood-discs incapable of that process of exhalation, on which, as we have seen, the activity of the organism depends. The blood, to all appearance, preserves its vitality, for neither the form nor the color of its discs is altered; but the blood is really dead, because its restless changes are arrested. Ever wonderful is the fact constantly intruding itself upon us, that Life is inseparably linked with Change, and that every arrest is Death. Only through incessant destruction and reconstruction can vital phenomena emerge, an ebb and flow of being. The moment we preserve organic matter from destruction, we have rendered it incapable of the restless strivings of Life. A spirit like that of Faust seems ranging through all matter; and if ever it should say to the passing moment, "Stay, thou art fair," its career will be at an end.

The reader has doubtless often heard, with surprise, that the rusting of iron, the burning of a candle, and the breathing of an animal, are only three forms of the same process, three names for Combustion, or Oxidation. There is a certain fascination in such generalisations, and one always regrets to find them not correct. The rusting of iron and the burning of a candle are indeed two forms of one oxidising process; but Respiration can no longer be considered as in any sense a process of combustion—it is a twofold process of exhalation and absorption. The interesting experiments of Priestley will enable us to set forth the differences between Respiration and Combustion. He placed mice in a bell-glass, where in due time they were suffocated by the air which they had vitiated; other mice were introduced, and they expired immediately. In another bell-glass a candle went out, after having in its combustion absorbed a part of the oxygen; another burning candle was introduced, and it was at once extinguished by this vitiated air. In both of these vessels some mint was now placed, where it flourished, and so completely revived the air, by absorbing its carbonic acid and giving out oxygen, that mice could again breathe in the one, and a candle burn in the other. In these

experiments we seem to have a demonstration of the identity of Combustion and Respiration—and this, indeed, was the conclusion drawn; but that the conclusion is erroneous, appears from the experiments of Claude Bernard, who takes a bell-glass containing an atmosphere of 15 per cent of oxygen, and 2 per cent of carbonic acid—the rest of the oxygen having disappeared to form water with the hydrogen of the candle which has just gone out. In this atmosphere, in which a candle will not burn, a linnet will breathe at ease for some time. He reverses the experiment, and makes an atmosphere in which a candle will burn, but in which an animal instantaneously perishes—an atmosphere composed half of oxygen and half of carbonic acid, in which a candle will burn better than in the air, because of the greater amount of oxygen; but in which the animal perishes, because, in spite of the amount of oxygen, that oxygen cannot be absorbed. The bird, when about to expire in vitiated air, will be recalled to life if the carbonic acid be removed by the introduction of potash—showing that it is owing to the presence of this carbonic acid that Respiration is impeded; but we cannot thus restore the expiring flame of the candle by removing the carbonic acid. Take two bell-glasses, and as soon as the combustion grows feeble, introduce into one glass some potash to remove the carbonic acid, you will, nevertheless, find that the candles in both glasses will go out at the same instant. The experiment is very simple, and its significance is plain. By it we see the difference between Combustion, which is only oxidation, and Respiration, which is not *oxidation* but *exchange*. In the combustion of the candle the oxidation is everything, and no process of exchange takes place. In the breathing of an animal the exchange is everything. The candle expires because there is not enough oxygen in the air; the animal expires because there is too much carbonic acid in the air.

Further, to prove that Respiration is an exchange of gases in the lungs, and not a process of oxidation, we need only refer to the experiments of Spallanzani and W. Edwards—experiments so celebrated, that one is amazed to find one's-self citing them in this discussion, which they ought long ago to have closed. These physiologists found that cold-blooded animals will breathe in an atmosphere of pure hydrogen, almost if not quite as easily

as in ordinary air: the carbonic acid is exhaled, and hydrogen absorbed.* This proves that carbonic acid pre-exists in the blood, and is not formed during respiration by the oxygen as it enters; and proves, likewise, that the respiratory process is one of exhalation and absorption, which can take place as well with hydrogen as with oxygen: and we are thus forced to exclude the idea of oxidation altogether. Although Respiration can take place without oxygen, life will not long continue without it; for, as before stated, oxygen is the power which burns organic matter into life.

Why is death inevitable when the access of fresh oxygen is excluded? The fact we know—of the reason we are ignorant. There still remains a large quantity of oxygen in the blood of the expiring animal; nor will death be sensibly retarded if fresh oxygen is injected into the veins and arteries. How is this? The process of Respiration brings oxygen to the blood; yet, if the oxygen be brought there through a more direct channel while respiration is impeded, the animal will die as quickly as if left to itself. Bernard tied a dog's head in a bag, which would in a certain time produce suffocation, and he found that period by no means retarded when he injected oxygen into the arteries.

Quitting for a moment this labyrinth of difficulty and doubt, which alternately fascinates and disheartens us when we strive to gain some explanation of the myriad processes of Life, let us stand apart and contemplate the marvel of respiratory interchange no longer as an animal function, but rather as a planetary phenomenon; let us endeavor to picture to ourselves the silent creative activity everywhere dependent on this interchange. The forests, the prairies, the meadows, the corn-fields, and gardens—the mighty expanse of plant-life covering mountain and valley—subsist on the carbonic acid which is exhaled from the lungs and bodies of animals. Plants take up this carbonic acid from the atmosphere, mould the carbon into their own substance, and set free the oxygen, once more returning it to the atmosphere. Animals reverse the process, taking up the oxygen, and giving out carbonic acid for the nourish-

* The same is true of warm-blooded animals when newly born, but after they have breathed for a few hours, they no longer possess this capability. The reason is unknown.

ment of plants. This beautiful rhythmus of organic life has been so often described, that it has almost become a commonplace, without, however, losing its charm for the contemplative mind. The dependence of plant on animal, and of animal on plant, united in one mystery, and ever acting each for the advantage of the other, is not an idea to lose its charm by becoming familiar; but it sometimes leads to misconceptions. What, for instance, seems more natural than that the influence of trees planted in our cities should be very beneficial? If trees can thus withdraw the noxious carbonic acid from the vitiated air of cities, would it not be desirable—nay, ought it not peremptorily to be demanded—that as many trees should be planted in our streets as we can find room for? Such conclusions are soon reached by swift logicians. But Nature is apt to elude the grasp of swift logicians, and she repeatedly declines to fall into the most symmetrical of their formulas. Not that Nature is capricious or illogical; but logicians are apt to draw inferences before they have collected sufficient data. Nature, in the present case, point-blank declares that the influence of vegetation on the atmosphere is totally *inappreciable*, unless the atmosphere be in a closed chamber or vessel, and *then* the influence is striking. Human wit has discovered no test delicate enough to appreciate the influence of plants on the free atmosphere in which we live. The depth and compass of this air-ocean are too vast, and the amount of oxygen absorbed by animals too trivial in comparison, for any effect to be appreciable; moreover, the mixture of the gases in the air, and their mutual diffusion, is so rapid, that no difference has yet been detected in the proportions of oxygen and carbonic acid in the air of crowded towns or wooded valleys. The air of cities will hold more noxious exhalations suspended in it, but its gaseous composition will be the same as that of the country. To give an idea of the insignificant part played by animals as vitiators of the great air-ocean, we may mention the calculation made by the distinguished chemist Dumas, that all the oxygen consumed by all the animals on the surface of the globe during one hundred years would not amount to more than the 1-8000 of the quantity in our atmosphere; and even supposing all vegetation to be annihilated, consequently no oxygen to be returned to the air by the in-

cessant reduction of the carbonic acid, there would still need a period of ten thousand years before the diminution of the oxygen could become appreciable by any instruments we have hitherto invented.

After having thus described the essential characters and conditions of the respiratory process, it will be interesting to glance at the results obtained by various investigators respecting the variations among different animals, and in different states of the same animal. We learn, for example, without surprise, that animals of large bulk consume more air than the smaller animals; horses and oxen more than men; men more than dogs and cats. But, to use an Eastern figure, it raises the eyebrow of astonishment when we learn that the proportion of carbonic acid exhaled by a man and a horse bears no sort of correspondence to the differences in their relative bulk—the proportion being 187 to 16. We are, in like manner, puzzled to find that a full-grown cat only exhales 1·2·3 of carbonic acid, where a rabbit produces more than 2. How is this to be explained? Is there not a streak of light trembling on this question when we bring forward the fact previously mentioned, that the vegetable feeders uniformly exhale more carbonic acid than the animal feeders, and that carnivorous animals exhale more than their usual quantity if they are fed on vegetables? Some light may fall from this source, but it does not suffice to clear up the obscurity. Another interesting problem also arises here. Although the larger the animal the greater is the *absolute* amount of carbonic acid it produces,* yet, the smaller the animal the greater is the *relative* amount it produces. Thus, supposing the production of carbonic acid be estimated according to each pound weight of the animal, then we shall find that the smaller the animal the greater will be its proportion. But it is not size and weight alone which determine the differences in the amount of air consumed; far greater differences will arise from the varieties of organisation. We may accept it as an axiom in physiology, that the activity of Respiration is inseparably connected with

* This applies, of course, only to animals of the same kind. "Vous serez étonné," says Spallanzani, "quand je vous dirai qu'une larve du poids de quelques grains s'approprie presque autant d'oxygène dans le même tems, qu'un amphibie mille fois plus volumineux qu'elle."—*Mémoires sur la Resp.*, p. 69. This is because the insect lives so much more rapidly than the reptile.

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vital activity—not simply muscular activity, as some writers maintain, but all processes whatever involving chemical change within the body. The most striking confirmation of this axiom is perhaps to be seen in the phenomena of hibernation or winter-sleep. No sooner are the vital functions reduced to this extremely feeble condition, in which we may almost say life is suspended, than these hibernating animals are so incapable of ordinary respiration that they may be placed in an atmosphere of pure carbonic acid, and remain there unhurt for hours; whereas if they were placed in such an atmosphere when their breathing was going on, they would instantly perish.

One would imagine, on hearing this, that our ordinary Sleep would also bring with it a diminution of the quantity of air consumed. And in as far as sleep may be considered a diminution of the vital activity, such a conclusion must be correct. But in how far is sleep a diminution? That is a question not hitherto asked, consequently without as yet an answer. In sleep there is very obvious diminution of some forms of vital activity, but we are by no means sure that the organic changes are so much less rapid on the whole. We are led to this by the experiment of Moleschott and Böcker, which establish that the chief cause of the difference noticed between the amount of carbonic acid produced during the day and night is the influence of *sunlight*; and that a man lying quietly awake will produce *less* instead of more than a man asleep, if the conditions of light and temperature are the same. Sleep, *as* sleep, is not therefore a diminution of the vital activity; although the sleep which we take at night after the fatigues of the day must of course be considered as accompanied by a diminution. It is quite certain that, partly from fatigue and partly from the absence of sunlight, less carbonic acid is formed at night than during the day. Boussingault found that the same turtledoves during day and night showed a difference of 94 and 59 on one occasion, and of 75 and 53 on another. Lehmann confirmed the observations.

If it is true that all vital activity increases the amount of carbonic acid exhaled, and if every diminution is accompanied by a corresponding diminution of the amount, we may readily believe that intellectual fatigue, and the lassitude which succeeds mental or

emotional excitement, will be accompanied by a corresponding depression of the respiratory function. Nay, even the concentration of the mind on any subject will produce this. Every one knows the state of "breathless attention." Whenever the mind is preoccupied by a powerful impression of some duration, the breathing becomes so feeble that from time to time we are forced to compensate this diminished activity by a deep inspiration. This is the rationale of *sighing*, an action commonly attributed only to grief, but which is the accompaniment of all mental preoccupation. The philosopher, brooding over his problem, will be heard sighing from time to time, almost as deeply as the maiden brooding over her forlorn condition. All men sigh over their work, when their work deeply engages them; but they do not remark it, because the work, and not their feelings, engages their attention, whereas during grief it is their feelings which occupy them.

It is an interesting fact, and one which throws light on the intimate connection between respiration and vital activity, that a very considerable increase in the production of carbonic acid swiftly follows after eating, consequently an enormous reduction in the amount is found to accompany starvation. The fact was established by Spallanzani, and has been repeatedly confirmed. Boussingault found that pigeons, when fasting, did not produce half the amount which they produced when well fed. Spallanzani suggests that the food during digestion gives off carbonic acid, and this passing into the blood, is exhaled in respiration—a suggestion which receives additional force from the fact that vegetable food uniformly produces more carbonic acid in respiration than animal food. But this will scarcely account for the whole of the increase, and we are led to seek in the greater activity of the nutritive processes for the other cause thereof: the fasting animal has a depressed vitality.

Temperature has considerable influence on respiration. The fact has been ascertained by experiment, but it might have been deductively established; for the influence of temperature on the vital activities is well known, and whatever influences them must affect respiration. It is only by the aid of such an axiom that we can find our way amid the apparent contradictions of this subject. The remarkable difference noticed between

the capabilities of warm and cold-blooded animals in breathing vitiated air, is not less than the difference in the effect of temperature on these two classes. We remember our astonishment on learning from Spallanzani that increase in the temperature brings with it an uniform increase in the amount of oxygen absorbed by molluscs and reptiles; it was a statement in direct contradiction to the well-established fact in human physiology, that more oxygen was absorbed in cold than in hot weather. Our difficulty was lightened, however, when we learned that Spallanzani's statement is only true of cold-blooded animals, and true of them only within certain limits; too great a heat ceases to increase the amount, and gradually diminishes it, as with warm-blooded animals. What are these limits, and why this cessation of increase? The limits are these: take a frog and place it in an atmosphere a little above the freezing point; as the temperature rises from 36° to 45° Fahrenheit, the amount of oxygen absorbed uniformly increases; it remains nearly stationary from 45° to 57° ; at 58° it begins to decrease, and this decrease continues till 104° is reached, and then the frog perishes. The reason is very simple: a certain amount of heat stimulates all the vital functions of the frog, and consequently increases its need for oxygen; when the heat becomes too great it ceases to be a stimulant, and depresses the functional activity, till at length a point is reached when the organism can no longer exist.

On warm-blooded animals the effect of temperature is apparently different, but really the same. Every increase of heat is found to diminish their respiration, every increase of cold to augment it. Thus it is ascertained that the smaller mammals, at a temperature of 86° to 104° Fah., consume only half the quantity they consumed at freezing point. Various experiments on man have elicited the general fact, that under the influence of a moderately cold atmosphere the respiration is increased by one-sixth more than in a moderately warm atmosphere. Precisely as too intense a degree of heat diminishes the respiration of the frog, by enfeebling its vital activity, does too intense a degree of cold diminish the respiration of a warm-blooded animal by enfeebling its vital activity. There are certain limits of temperature within which every increase of heat raises the respiration

of the frog, because the increase raises its vital activity; and there are certain limits within which every decrease of heat raises the respiration of the man, because the decrease raises his vital activity; but if these limits be overstepped, the stimulant is changed into a debilitant.

We see this very curiously illustrated by the hibernating animals, the dormouse, marmot, bat, hedgehog, &c. They occupy in this respect, an intermediate position between the cold-blooded and warm-blooded animals; for although they are really warm-blooded animals, the effect of temperature on them is closely allied to that produced on the cold-blooded. No sooner is there a fall of external temperature than their respiration diminishes. Unlike the rest of warm-blooded animals, their organism seems to have little power of resisting the changes of external temperature; they cannot produce heat with sufficient rapidity to counterbalance the loss they sustain from the surface of their bodies when the air is cold. Instead of acting on them as a stimulus, which would accelerate the respiratory process, cold acts on them with a depressing influence which gradually reduces their respiration almost to zero. But no sooner have they passed into this winter-sleep, and their organic activity has become almost null, than we can at pleasure reawaken it to any degree by raising the surrounding temperature, and as the vital activity once more begins to manifest itself, the respiration (which is only one form thereof) likewise becomes manifest.

Why do we breathe? The foregoing pages have given some answer to the question, *How* do we breathe? but have not yet hinted at the *why*, yet after reading about the respiratory process, a natural curiosity prompts the inquiry as to its cause. Unhappily nothing but extremely vague answers can be given. We know that the chest expands and contracts with beautiful rhythm, and, mostly, as an involuntary, automatic process. We know that our attention is not required, that no effort is needed, and indeed that no effort of ours can prevent the regular alternation of inspiration and expiration. We can by an effort accelerate or retard these motions, but we cannot prevent them. The process, then, clearly depends on a stimulus given to the involuntary part of the nervous system: it is called into action by nervous stimulus, and

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physiologists have vainly endeavored to discover the nervous apparatus which is involved and the rationale of its action. The pressure of carbonic acid in the air-cells, or of venous blood in the capillaries, may act as a stimulus to the pneumogastric nerve; but what is the rationale of whipping a newly-born child's back and continuation, as a means of making it draw breath? Generally, the stimulus of the cold air on the child's face suffices to make it draw breath, which it expires again in a well-known cry, to mothers' ears most musical; but this stimulus is often insufficient and the doctor or nurse initiates the little

stranger into that experience of "external local applications," which, in later years, will also be freely used as a stimulus to virtue or learning. The fact we know; but why such "local applications" excite the respiratory activity, we do not know, for we do not know the nervous apparatus which regulates the actions of respiration. It is probable that the researches of physiologists will, ere long, clear up this point, as they have cleared up so many others; meanwhile we must content ourselves with vague answers to our question Why do we breathe?

Early Ancient History; or the Ante-Greek Period, as it appears to us since the most recent discoveries in Egypt and Assyria. By Henry Menzies.

THERE are, says Mr. Menzies, but two classes of historical English books, one too elaborate for common readers, as Grote's Greece; others are mere compendiums. This judgment is stated too broadly. Merivale for part of Roman History, and Schmitz for Ancient History in general, have passed far beyond mere school compendiums in treatment as well as in length; not to mention other authors. Particular histories have been treated broadly in books, and historical periods in popular lectures, not very much unlike the manner in which Mr. Menzies handles the history of Egypt, Palestine, Nineveh, and Babylon, as well as that of the Medes and Persians. The leading information respecting the manners, customs, arts, and so forth, of these peoples, as drawn from monuments and their so-called history, as recorded by ancient writers, are doubled up in this volume in a popular and indeed rather telling manner. The book is "intended for popular use," for which it is well designed; but the flourishes that herald it in the preface could have been spared.

DEEP SEA SOUNDINGS.—When Lieut. Berryman, with the apparatus for deep sea soundings, invented by Lieut. Brooke, succeeded in bringing up and placing under the microscope actual specimens of the bottom of the deepest ocean, it was naturally asked by many, Of what value a handful of mud from the bottom of the ocean could be? But such questions are never asked by the true students of natural phenomena, to whom it is sufficient to know that they have conquered a portion, however small, of Nature's unknown territories; and the sequel soon showed that this conquest was one of positive and incalculable value to the whole world.

The specimens were submitted to the microscope and found to consist, not of mud, nor of sand nor gravel, but of Infusoria, and shells so minute so fragile and delicate of texture, that they could almost be dissipated into nothing by a breath. From this fact Lieut. Maury immediately concluded that the bottom of the ocean, from whence these specimens came, must be undisturbed by currents, or they would have been abraded and ground to dust, and that as the Gulf Stream ran across the Atlantic in a direction a little south of and parallel to this line of soundings, the current must have heaped up a bank upon its northern side from which these soundings came. Thus Brooke's lead revealed and verified the fact of the existence of this ridge, and that it was covered, probably to a depth of many feet, with a cushion as soft and yielding as eider down, in which a wire might repose with perfect safety, and this was the famous "Telegraph Plateau."

A FEW days ago, Lord Brougham cut the first sod of the Eden Valley Railway. His mode of doing so was very characteristic. "Lord Brougham," says the *Carlisle Journal*, "received from the brawny navy who stood beside him a neat spade, with which he cut the first sod, and threw it into a handsome mahogany barrow, which had been provided for the occasion. His lordship then, with a vigor as remarkable as it was characteristic, wheeled the barrow along some planks that had been laid for a distance of some ten or a dozen yards, emptied its contents, and then, in a truly navy-like manner, turned his back, and pulled the barrow to the point whence he started. During the operation, the most deafening cheers resounded from every part of the field. His lordship appeared to be much amused with his own performance."

THE HOUSE IN THE MEADOW.

It stands in a sunny meadow,
The house so mossy and brown,
With its cumbrous old stone chimneys,
And the grey roof sloping down.

The trees fold their green arms round it—
The trees a century old,
And the winds go chanting through them,
And the sunbeams drop their gold.

The cowslips spring in the marshes,
The roses bloom on the hill,
And beside the brook in the pasture
The herds go feeding at will.

Within, in the wide old kitchen,
The old folks sit in the sun,
That creeps through the sheltering woodbine,
Till the day is almost done.

The children have gone and left them;
They sit in the sun alone!
And the old wife's ears are failing,
As she harks to the well-known tone

That won her heart in her girlhood,
That has soothed her in many a care—
And praises her now for the brightness
Her old face used to wear.

She thinks again of her bridal—
How dressed in her robe of white,
She stood by her gay young lover,
In the morning's rosy light.

O! the morn is as rosy as ever,
But the rose from her cheek has fled;
And the sunshine still is golden,
But it falls on a silvered head.

And the girlhood dreams, once vanished,
Come back in her winter time,
Till her feeble pulses tremble,
With the thrill of spring-time's prime.

And, looking forth from the window,
She thinks how the trees have grown
Since, clad in her bridal whiteness,
She crossed the old door-stone.

Though dimmed her eye's bright azure,
And dimmed her hair's young gold,
The love in her girlhood plighted
Has never grown dim or old.

They sat in peace in the sunshine
Till the day was almost done,
And then at its close an angel
Stole over the threshold stone.

He folded their hands together—
He touched their eyelids with balm,
And their last breath floated outward,
Like the close of a solemn psalm!

Like a bridal pair, they traversed
The unseen mystical road
That leads to the Beautiful City,
Whose "builder and maker is God."

Perhaps, in that miracle-country,
They will give her, her lost youth back,

And the flowers of the vanished spring time
Will bloom in the spirit's track.

One draught from the living waters
Shall call back his manhood's prime;
And eternal years shall measure
The love that outlasted time.

But the shapes that they left behind them,
The wrinkles and silver hair—
Made holy to us by the kisses
The angel had printed there—

We will hide away 'neath the willows,
When the day is low in the west,
Where the sunbeams cannot find them,
Nor the winds disturb their rest.

And we'll suffer no tell-tale tomb-stone
With its age and date to rise
O'er the two who are old no longer,
In the Father's House in the skies.

A GERMAN FUNERAL HYMN.

"Here we have no continuing city, but we seek one to come."—*Heb. xiii. 14.*

"Wohlanf woplan! zum letzten Sang,
Kurz ist der Weg, die Ruhe ist lang."

COME forth! come on, with solemn song!
The road is short, the rest is long.

The Lord brought here, he calls away:
Make no delay,
This home was for a passing day.

Here in an inn a stranger dwelt,
Here joy and grief by turns he felt;
Poor dwelling, now we close thy door!
The task is o'er,

The sojourner returns no more.

Now of a lasting home possessed,
He goes to seek a deeper rest.
Good night! the day was sultry here,
In toil and fear.

Good night! the night is cool and clear.

Chime on, ye bells! again begin,
And ring the Sabbath morning in:
The laborer's week-day work is done,
The rest begun,
Which Christ hath for his people won!

Now open to us, gates of peace!
Here let the pilgrim's journey cease:
Ye quiet slumberers make room

In your still home,
For the new stranger who has come!

How many graves around us lie!
How many homes are in the sky!
Yes, for each saint doth Christ prepare

A place with care:
Thy home is waiting, brother, there.

Jesus, thou reignest, Lord, alone,
Thou wilt return and claim thine own,
Come quickly, Lord! return again!

Amen! Amen!
Thine seal us ever, now and then!

—*F. Sachse.*

From Household Words.
THE CANON'S CLOCK.

I. AT THE FOUNTAIN.

It was the prettiest thing I had seen in the course of that day's march. It stood at the corner, where the road divided half way up the hill; and I had been wondering as I worked my way wearily up what this little bit of building would turn out to be at last. It is a stone shed—it is a broken pedestal—I said at every heavy step. It might have been any thing, but for that sparkling, shining thing in the centre, which soon helped me to its true meaning.

A fountain, to be sure! Which should have been known to me a good half-mile off but for that dulness which visits weary eyes. An elegant little bit of builder's work, of the greyest iron-grey stones, like a Moorish tower, furnished with clusters and bunches of decayed iron-grey pillars, and four sharp arches, one for every side. All kept warm, as it were, by snug moss and ivy jacketing, which crept round and round about in belts and comforters for the old iron-grey pillars. While, over-head, in a little snug niche—barely large enough, it must be said—was a little figure of a saint, iron grey too. The saint was pointing downwards to what I had seen sparkling and glittering from the foot of the hill—to the fresh gush that came out with splash and spray and luxuriance into the old stone basin; which, having a slice bitten as it were out of its side, let the fresh water run wild and make a shining pool for itself among the stones. Its own water orchestra played all the while it gushed—played me up the hill.

"The gem of the day's march," I thought. And so, loosening my wallet, I brushed the dust away from the stone bench, and sat down.

"What was the Blandusian fount," I said aloud, taking some of the water in a leathern cup, "which glittered more than crystal to this? Crystal! Why here are diamonds, my old Venusian! This fountain against yours—kid and all!" And here I filled the leathern cup again. "Here's to the fountain of—hum—what's the name, in what parish?"

The fact was, I had lost my road some three hours and a half before. Stay; there was something like a sign-post. So there was—and so there should have been, if there were not. For this spot where the two roads

branched off was a tongue of meadow, and on the very tip of the tongue was planted this pet spring of mine. "I will see what our signboard has to tell," and with that I got up from the stone seat and walked to the back of my fountain. Said the sign-post—by one of his straggling arms which hung to him quite loosely, and would assuredly part company at the next gust—said this disorderly limb: "To Petit-Pont, so many [illegible] leagues." By the other, which he carried more decently: "To Mèzes, so many [illegible also] leagues." Filled with which information, I came round again to the stone seat, and, regarding my wallet with a certain animosity, "I must carry it," I said aloud, "to Petit-Pont or to Mèzes, that is certain. I may bear it in to Petit-Pont or to Mèzes, over their sharp paving-stones, likely enough, at midnight, or, say, at break of day. The pedestrian who has not yet dined, will have, perhaps, to forgo bed. I angrily emptied out the leathern cup which I had half-filled; a thimbleful of Burgundy would have been worth the whole spring bottled off. I was out of sorts with the pet fountain. "Your moss jacketing," I said, addressing it moodily, "and your iron-grey pillars and arches, and your saint, too, are all well enough, and your water-music is respectable; but I think for the highly-important position you occupy—which, being one of bifurcation, has extraordinary responsibilities—you might look a little to your sign-posts. The Blandusian fount was worth a dozen of you! No disrespect to you, sir," making as though I would take off my hat to the saint, who, I thought, was looking down a little sourly; "these matters are not in your keeping, sir!"

The sun was going down; the day was nearly spent; and it was long past dinner-time. I do believe the good saint, in that mossy surtout of his, had appreciated handsomely the little compliment I had paid him at the expense of his fountain, and sent me help in that matter of deciding betwixt Petit-Pont and Mèzes, for, just turning my eyes towards the foot of the hill, I espied two objects beginning to ascend—a very little French child, driving before her a goat.

They came up the hill slowly enough, for the goat would stop every now and again to crop a tempting bunch of herbage, and the little child would wait for him patiently;

which gave me time to find out that she was the queerest little old woman of a child that was ever sent in charge of a goat. She had on a little blouse that went down to her heels, and a little, clean woman's cap of linen with a frill to it. When she was near the top she caught sight of me, and put on a sort of stiff gait or comical little strut, dropped me a little curtsy, dropped another most reverential curtsy to the saint, and stood by while the goat drank his fill.

"Come here, ma petite—little epitome of a woman, most curious miniature housewife!" (The last titles expressed in the English tongue.) "What is the goat called?"

She was on the other side of him, and leaning on his tough neck; and, without answering, dipped down her head behind him.

"What is his name, little one?" I said again, encouragingly. "He is the finest fellow of his years in the parish, I'll swear!"

She was playing hide-and-seek with me behind that goat's neck of hers, instead of answering me; and, when I did catch a glimpse of her, she was smiling roguishly, with the top of her finger in her mouth.

"Big Beard!" she said at last, "Grosse Barbe!"

"You love Big Beard, then, little one?" I said.

With more of the playing hide-and-seek, she answered:

"I do love him very much—next to father. See this, sir; I love papa one thousand—Grosse Barbe five hundred!"

"And me?"

Here she kept holding Big Beard's rough head and neck between me and her. "She will be the coquette of the whole village when she grows up," I said; and that brought another question to my mind—which was nearer, Petit-Pont or Mèzes.

She said the words over thoughtfully, looking round her and stamping with a little foot upon the ground, to keep time as it were, then shook her head doubtfully. "I will ask Grosse Barbe," she said.

I fell to laughing at this notion, though vexed enough that I was destined to have no help from this quarter.

"And where, then, dost thou live, my child; thou and thy Grosse Barbe?"

"Over the hill, sir; in papa's little cottage, Big Beard has a great house all to himself at

the end of the garden. We are so happy, sir, the three of us."

I had no doubt of it, I said, musingly; for I was thinking that, at this cottage, I would learn the relative distances of Petit-Pont and Mèzes. By this time Big Beard, thinking there could be no earthly object for staying, now that his thirst was slaked, was moving on up the hill.

"See, Grosse Barbe will not stay," she said. "I must go, too." And with that she jerked me a little curtsy, jerked another to the Saint, and set off after her goat.

If I had not been too lazy to unpack my wallet, I should have had out colors and brushes and the rough sketching-paper in a twinkling. Child and goat would have been washed in boldly, and slept that night in the portfolio. But the notion of an encounter with the stiff straps and buckles—Not at that season certainly. The sketcher, dinnerless, makes a poor picture after all.

They had taken the left prong of the Fork, and were now just over the top of the hill. So I hoisted up my wallet (it might have been a sack of coals from the weary way I did it); and, taking off my hat to the Saint—

There was some one coming down the hill on the right prong. At least there were steps, and good steady ones. A tree hung over the road and hid what was approaching. So, without moving a step out of my position, I waited, strapping the wallet, until it should have come round the tree, whatever it was. The steps came closer, and, from under spreading branches of the tree, there emerged—as from under an archway—a figure in a dark robe, half-cloak half-soutane, with a sash round his waist, with a little skull-cap on his head, covering grey hairs, and about the fairest old man's head I had fallen in with for many a long day. A sort of country curé or pastor; and, with that, as indeed was only becoming, I took off my hat to him as I had done to the Saint, and wished him good evening.

As I wished him good evening, he took off his little skull-cap with a Frenchman's grace, and halted.

"I had apparently travelled far, that day," he said, in the softest and most benignant of tones. "It was weary work," he said, "heaven knew it, this trudging along the

dusty roads. The close of day must come gratefully enough to the traveller. He presumed I was a stranger; could he be of any assistance?"

"You could tell me, sir," I said, "what I have been craving to learn these three hours—namely the distance of these towns." And I pointed up to the sign-board.

"Why," said the Abbé, "I have just come from Petit-Pont. It is barely a league from this."

"A long French league," I sighed. "Perhaps Mèzes is nearer?"

"Two leagues and a half," says he with a gentle smile; "but there is a cross-road over the fields, reducing it to scarce half a league."

"Aye," I said, with another sigh; "but full of all manner of turns and twists?"

"So it is," said the Abbé.

"I was going to see a poor sick peasant," he added, presently—(there was a little basket under his cloak, doubtless holding certain comfort for the sick peasant)—"but a quarter of an hour's difference will not be much matter. I will show you the way."

There was a little friendly contention on this. I protested against this diversion from his journey and its pious end. The trouble—the fatigue. I would not for the world.

"'Twill be a pleasure," said my Abbé smiling. And he had his own way.

Across the fields, then, by paths under shade, and over stiles and past farming cottages. Barely ten minutes and I heard faint chiming as of bells very old and mellow. "Petit-Pont church," I said, turning to the Abbé, "that must be seven o'clock!"

He had stopped short suddenly, and was fallen a little behind, describing figures on the ground with his stick.

"Seven o'clock—seven by the clock! just look here, sir."

I came up to him with a little wonder.

"See here," he said, still working with his stick, "here was the escapement—here was the lever. Barrels were behind—plenty of tooth-wheels. I could have given any number; and yet it wouldn't do!"

I looked from his stick to him with increasing surprise. "What wouldn't do?" I asked.

"Now, see," he said, with a curious look in his eyes, "there was no reaching that double movement—no! I might have worked my

poor brains out before that. Wheels within wheels, indeed!"

I began to have a glimmering of how it was with my poor Abbé. "We had best make for Petit-Pont at once," I said to him. "It is getting late."

"No, no!" he answered, sitting down upon the bank. "I must stay here and work the thing out. An idea has struck me. It might bring the whole thing straight. The beats being isochronous, of course." Then he fell to making fresh figures. "Go your way, monsieur; don't heed me. Yonder is the little town—the road is straight to it. Pray go, monsieur. I feel nervous about this calculation."

"But to think of leaving you here, Monsieur l'Abbé, it is——"

"'Twill escape me. I shall lose this precious thought," he said, rising up quite excitedly.

"I go," I said, a little alarmed, and turned round towards the town.

It is best not to cross these strange spirits, and I could tell some one in Petit-Pont; where, doubtless, his ways were known; and, with this commendation of him to Providence I left the poor Abbé to his own shifts, and soon was at the threshold of the little town,—a sort of halt for the posts. I first saw a straw-house or two; then trees; then a stray fellow in his blue frock driving a cart; then more houses; fewer trees; all introducing me to the solid, substantial paving! A narrow street, with different sized houses of the true French cream-color; a street running in twists and curves. An inscrutable Boulanger or a baker's-store; general store, also, with the open cask of rotten pears, all mashed up, at the door, and a bunch of peg-tops in a net. An old grey-beard, in a cap and blue frock, leaning over the half-door; smart women with children in their arms at half-doors, too, and seen only in Kit-Kat. Children in wooden shoes clattering over the pavement; special groups gathered about the cask of mashed pears; but at most respectful distances, like dogs round costermongers' carts. So on, up to the posting-house, or tavern of the place—the Tête Noire or Black Head, where was good entertainment for beast; not so good perhaps for man; there being over-much tap-room savor to be inviting. Tap-room upstairs, tap-room down stairs—to the right and

to the left. I shook my head and sighed, as I stood before it. It would not do. I saw a buxom young person over the way, in Kit-Kat, with a child in her arms. Fancying I could read sympathy in her blooming face, I crossed to her.

"Dear, yes. O dear, yes. Only a little way out of the town was the Golden Rose inn, with a charming view of the country! A sweet spot monsieur would find it. Just to go on straight—straight as I could go. And, by the way, Monsieur will arrive just in time for a little diversion. For there was to be a wedding there to-night."

"So there is to be a wedding," I said, laying my hand on the lower half of the door, "a sprightly wedding! And whose? Yours?"

She shook her head a little dolefully, as I thought I saw a twitch on her cheek.

"Ah," said I, translating it to myself, "thy good man is not quite so loving: so full of the petits soins, as he used to be in those bright, early days, when the tambour was drummed, and the pipe played, and the neighbors gathered, on your wedding-night."

II. THE GOLDEN ROSE.

It was not likely that a man could very well miss it; for there it hung above me, swinging from an ancient tree in the very middle of the road. Here was a sort of circus formed by that road, fringed round with grass and hedges; and the circus was almost filled with light waggons and covered things, and a char-a-banc or two; while the horses were straying about at large. Plain out-speaking tokens of what doings were about. But, through the high, wooden paling, painted white, and the white-railed gates, there was the Golden Rose Inn itself to be seen, afar off as it were, with a pretty plaisance, as old-fashioned men called it, lying in front. There were vines loaded heavily, and sweet-smelling flowers, and little grass-plats and winding walks (not weedless, however), and an old broken fountain or two, now quite dry and thirsty-looking. Then, for the house of the Golden Rose itself—seen through the white rails of the great gates—it was of the pleasantest cream-tint, overlaid with abundance of green shuttering; high roof and chimneys, as in the old-established pattern. Surely roadside inn—Golden Rose or other—never looked out so invitingly across its plaisance. But, in truth, it needed no great stretch of thought

to divine that this had been the château of Milord Marquis, Seigneur in those parts; that is, long, long ago, before Milord Marquis was sold up or decapitated by the Septembrists, or turned emigré dancing-master in London. Now, by whatever shift it had come about, it was the Golden Rose, and kept by Hippolite Bontiquet, at my service.

That worthy had come forth, looking most festive in his bright blue coat and shining wig, and huge bunch of flowers at his button-hole, as soon as he heard the rattle at his great white gate. Although corpulent, Bontiquet came round the walk at a surprising pace, his crimson glistening oilily.

"Come in, come in, Monsieur," he said, throwing open wide both doors of his gate. "You are welcome, indeed! Soyez le bien venu of this happy night! You shall see a wedding, sir; and shall have every thing of the best with us. Come in, sir. Everybody shall be a guest to-night."

With that I followed the worthy man up his own broad walk, he talking all the time. It was Marie, his only daughter, who had that day been united to a well-to-do master wheelwright of the neighborhood.

"They will be as happy a young pair as are on the road from this to Paris," he said, rubbing his hands merrily; "or, indeed, as are in Paris itself. She is as good as pretty, and Jacques is the steadiest young fellow in all his parish."

"Twas a pleasant thing to watch the honest glow of pride and happiness in his cheeks,—pleasant to have lighted on such a scene of almost pastoral happiness. The bare notion put me into spirits.

"Believe me," I said, with much heartiness, "they will be as happy as you can wish them to be! As to the connubial bliss of those in Paris, 'twould be only a poor measure of comparison."

"Indeed I have heard so," says Monsieur Bontiquet, innocently.

"Then it would be best to put it down OUT of Paris."

"With all my heart," said Monsieur Bontiquet.

This was spoken at the door, under the porch of honeysuckles and twining plants. Then came to us sounds of voices and merry laughter from within.

"They are going to sit down to table," said Monsieur Bontiquet.

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I went in with him to the room. His Seigneurie (decapitated or banished) must have entertained company there on state-days: and now it is full to the door of the merriest laughing faces that marriage bell ever brought together. There was good-humor and mirth, and innocent joy, written in a fine round hand on every face. They were only waiting for Father Bontiquet.

"This way," said he, and led me straight up to the top of the room, where was standing a sweet village maid, all white and garlands. Her bridegroom was beside her; a smart young fellow, whose cheeks bore as much polish as rude health and towelling could give them.

"'Tis a stranger, Marie," said Bontiquet, "and we must make him welcome!"

With that he took his seat at the head, motioning me to one beside him. The newly married pair sat together on the other side of him. Monsieur le Curé, who had officiated, sat next to me, and said grace. Then there came a universal sitting down, to such shrieking of chair-legs over the oaken parquet floor and such shuffling of heavy shoes, as man could scarcely conceive. Then succeeded a universal bringing in and uncovering of dishes, the very best fare Monsieur Bontiquet's larder could compass. "Eat, drink, and be merry," said every glance of his honest face shooting down the long table. And truly, it had been a banquet for such funny men as go forth pencil furnished, beating up for queer twists and shapes of human physiognomy. A fine avenue it was—two rows of healthy human trees. Fine handsome swains—generals of division, counsellors of state, and maires in posse—each beside his swainess. Corydon busy with Phyllis, Damon delighting Chloë. There were grim, grizzled fellows, with chins like flax-carders, sitting together and talking gravely: they were long past such nonsense. And there was the comic man, or clown of the party, with a face that would have stood him fifty francs a-night, at the least, in the provincial theatre, convulsing all who had even bare view of him, which was about the whole table. His name was Corbeau—and Corbeau must have been the funniest fellow breathing. He was Laughter-holding-both-his-sides,—out of the poem and in the flesh! Marie and Jacques spoke to all around, and to each other with their eyes. Each look was a whole hour's talk.

"'Tis a sight," I said to Monsieur Bontiquet, "I would not have missed for a thousand francs. 'Twill do me good for the next twelvemonth."

"You do us honor," said he, with a bow, "but you have reason, Monsieur. My old heart has got young again, within the last half-hour. Ah! Jacques," he added, turning to him, "thou must take care of her!"

Marie looked at her husband, and answered for him with her beaming eyes.

"Thou art in gentle hands, Marie," I said.

"I will be his bail to thee."

"We shall not want you, Monsieur," said Marie, a little wickedly.

I whispered to Bontiquet. He shook his head. "But it must be—it shall be," quoth I. He gave way at last, a little reluctantly. With that he got up and tapped for silence on his table. "Our good stranger and guest here to-night, desires to present the company with some choice Burgundy."

"Send for it at once," Monsieur Bontiquet, without more ado," I said, standing up, "and let us drink the health of our bride in that noble fluid, à la mode Anglaise!"

Rapturous applause and satisfaction at this speech of the noble stranger. Corbeau positively turned a somersault with those grotesque cheeks and nose of his.

The fine old Burgundy was brought in, and we drink it à la mode Anglaise, to the bride's health, to the bridegroom's health, to my health, to everybody's health. That mode Anglaise grew so popular. More Burgundy—more healths and happiness.

"I would have walked," I said to Bontiquet, "again from Calais to Marseilles, for this."

"'Tis the happiest day of my life," said Bontiquet. "If we only had the poor canon here."

"He promised to come," said Monsieur le Curé. "He must have taken one of his long walks."

"He would have enjoyed this," said Bontiquet.

I thought of the strange Abbé I had met at the fountain.

"Messieurs," I said, "I fell in with an Abbé outside the town, at the fountain; who talked curiously concerning clock-work and wheels."

"Ah! the poor gentle soul!" said Bontiquet.

quet. "You must have touched on his weak point. He is all astray on such matters."

"'Tis his misfortune. Heaven help him!" said the good Curé. "He was for years inventing clocks, and it has turned his brain at last. God keep us our wits, when so gentle a man has lost his!"

"'Tis the sweetest nature in the world," said the Flax-carding Chin.

"And so wise and sensible in all things but clocks," said Monsieur le Curé.

"Curious phenomenon," I struck in with.

"So it is," said the Curé; "but he is the most amiable and charitable soul alive. Gives all his little means away; for which Heaven reward him!"

"See how he stopped his niece's marriage with a rascally spendthrift cousin, which would have ruined her. There was wit in that, I fancy, and no madness."

"The match is off, then," said the Curé. "Well, I am glad of it; such stories as there were through his parish concerning him! An utter ne'er-do-well."

"A very desperate fellow, they say," added Bontiquet. "The good Abbé's money would have helped him prodigiously. He had sooner he had the fingering of it than the poor."

It had now got to be between nine and ten o'clock. Bontiquet hammered on the table. "Messieurs et mesdames! lads and lasses! out on the green with you! Vive la danse! Let each one fit himself with the partner he loves best, and lead out on the grass. Under the vine-trees there shall be plenty of cooling drinks; I will look to that! So go forth—and vive la joie!"

That cry was in every one's heart, if not upon their lips. Handsome Corydons were all a-foot in an instant, and trooped out, holding Phyllis' fingers in theirs. Such a pretty procession as it defiled past Bontiquet and me!

There was the music all ready; a fiddle and a tamborine, played with delightful vigor! The little cymbals of the tamborine rattled musically. Shut your eyes, and it seemed to be the Spanish dance, bolero, or fandango. Such circling round and round again; such motion of many twinkling feet; such flashing of colors; such fall of leaves from roses under daintiest caps. This night Sir John Suckling had seen a whole legion of those mice (full-grown ones, though) to which he had so fancifully likened his mis-

treasses's feet when dancing, running in and out. The green was alive with skittering mice. Thrum the tamborine lustily; join hands, and round and round in a ring; scatter again, like a shower of falling leaves, and be mated in pairs!

I had walked thirty miles that day; enough to stiffen the limbs of any stout man. Said Bontiquet to me: "Here is a lively demoiselle that will give you her hand for a dance. Yet, Monsieur, rather, may go about and choose for himself; the stranger is as his majesty the king." There was the most roughish cap yonder I had ever seen; the neatest, daintiest thing in the world. "I will have Cap," I said; and Mademoiselle Rosalie was fetched for me at once. Corydon stood by a little jealously. "Why trouble so much as one honest heart on this glad night?" I said to myself. (The ghost of Mr. Sterne was at my elbow. He had once had such a dance on the road between Nismes and Lunel, where is the best Muscatto wine in all France.) So we went one merry round, offered her a short compliment, and brought her back to the side of Corydon. That youth looked grateful. What did Rosalie think of the stranger? Si bête! I dare say she told Corydon.

What was the significance of this sudden lull! this sudden dropping away of dancers? Tamborine thrumming grows halting, and nearly dies off altogether. The dancers are looking uneasily to the gate.

There are three horsemen in cloaks and slouched hats drawn up, looking in. Three mysterious, ugly-looking fellows, on tall strong horses. They are at the gate, looking in silently and scornfully. The taum-taum had now stopped altogether; the fiddle had found rest; Corydons, with Phyllises, are looking suspiciously and with awe at the silent horsemen. Bontiquet walks down slowly to accost them. We hear them laughing loudly and discordantly—shaking in their very saddles.

"Pretty inn-keeping!" says one, a low-browed, villainous fellow, with a scar on his cheek, the shortest of the three besides. "Pretty inn-keeping this! you must be laying by money at this rate?"

"Sacré!" says a second; "but here are pretty wenches—my soul! what if we rode in among them, and each picked for himself?"

Bontiquet was not to be put out that festive night. He was clearly inviting the horse men to dismount and refresh themselves, which only set them laughing the louder.

"Come! let us go forward," said the third, who had not spoken as yet. "Mordieu! what do we stand prating here for? Are we children? Come! en avant!" And he clapped spurs to his horse and set forward, the other two following close behind, swearing and contending with their horses.

"Lord deliver us!" said Bontiquet, returning; "what strange persons! What can bring them along our peaceful roads? But let us forget them, my children! Come! to the dance once more! Lead out your partners again, my brave Messieurs!"

Thrum, thrum, went tamborine again, with jingle jangle most musical. Ply your fiddle, village musician; here is fellow with pipe come to aid you. And so they took it up again until it began to darken. Then little pink and blue lamps began to twinkle among the trees — Bontiquet was improvising an illumination of his gardens. Up in the branches, along the borders of the walks, they were shining out.

III. THE CLOCK.

It was past ten o'clock, and time to have done with festivity. So the light cars and wagons were being got ready and horses put to. Time, surely to be gone. The bride was to go, too; to be seen home with an escort; to be waited on to her own door with torch-light and a handsome following; much noise and obstreperous laughter; much confusion in finding garments. But they are gone at last, out by the white gate! May they all be happier for that night's happiness furnished to the stranger.

It seemed lonely now, after all that hum of voices. "They are gone," said Bontiquet, with a sigh, "and I have a daughter the less. She was a good girl! Marie! Monsieur would like to see his room, doubtless; and no wonder, for he must be heartily tired! This way, Monsieur, please!"

He went on before, up a broad state staircase—to his Seigneurie, in the old days—with a balustrade up which one might have walked conveniently. It went to the right and to the left with grandest sweep, and landed us in a grand picture corridor, where there were no pictures now. The corridor was a grand

room in itself, and off it were other stately apartments.

"O mon Dieu!" said Bontiquet, stopping, as his foot touched the top step. "I had quite forgot the poor canon. Where is he? Our fiddling and dancing swept him clean away from my head! He ought to have returned long since."

"'Tis rather late," I said, "for the good man to be abroad."

"He has some little ways of his own," said Bontiquet, thoughtfully, "like all poor folk affected as he is. He is most likely gone up to the town, and will stay there the night."

"It is likely enough," I said. "What a pity so gentle a soul should be so visited!"

"Ay!" said Bontiquet; "and yet but for that one little crookedness, he is as the rest of us. O, so good, so noble, so full of sweetness and charity; giving to the poor almost every sou of that large fortune Providence has given him. But if you touch on that one subject! Mordieu! I wish there were no clocks in the world!"

All this was spoken when Monsieur Bontiquet's foot was on the last step of his oaken stair. He was shading his candle all the time with his hand, scattering about him a cloud of black dancing shadows. We passed on down the broad gallery.

"This," Bontiquet said, touching a door with his hand, "is his room when he stays with us—when he comes this road—sometimes for a fortnight, for a month even at a time. For you must know, Monsieur, he roams in this way about the country the whole year round. This is his room," he said, opening the door softly; "and here he keeps that famous clock, the making of which, 'tis said, turned his poor brain. A wonderful work!"

We entered; a fine spacious apartment, lofty, and glistening all round with oak panelling. It was divided by a broad archway and tapestry hangings (drawn back, however) from another room as spacious, where could be made out the dusky outline of a huge bed. And on the chimney-piece, in front of a huge mirror, was this famous clock which had cost a man's wits.

"See," said Bontiquet, holding the candle close, "what a wonderful thing it is! Every night, towards twelve o'clock, he sits up to wind it; which he does with such tenderness! it might be a child he was putting to bed."

It was one of those curious horological toys that used to be the fashion in the early days of clock-making. The poor Abbé with marvellous ingenuity had peopled his clock with all manner of strange actors. There was the cock on the top, that came out and crowed for the quarter and half-hours. There was the door that opened, and the procession of men and women that came forth for the striking of the hour. There was a bell-ringer that pulled the bell, and rung out the time. There were the changes of the moon and seasons; the movement of the stars, and innumerable other devices very pleasing to contemplate. No wonder they had set a man's wits awry. As we stood looking, the cock flapped his wings, and crowed, the figures came trooping solemnly, and drew up with a quaint gravity, and the bell-ringer tolled out eleven o'clock.

"It has this convenience—the absence of our Abbé," Bontiquet said, "that it gives you choice of rooms. Our house is full, and you would have to ascend to a little apartment up-stairs. Will you choose this room?"

"With all my heart," I answered. "I love these great chambers. I shall be the departed Seigneur for a night at least." Still I hankered to learn more concerning the poor wandering priest.

"One word," I said. Bontiquet was going to the door. "What was that spoken during dinner about the marriage of his niece?"

"Only this," said he, "that he has wit to save her from a wicked husband; the worst fellow, I am told, in the kingdom, and she has sense enough to hearken to her uncle. He has written and threatened him, but in vain. Dieu merci! He held firm. I will now wish Monsieur a very good night!" He closed the door softly behind him, and left me.

I was soon swimming, as it were, in the Great Sea of Napery, floating in an ocean of broad linen. In these great beds on the Ware model, a prodigious luxuriance—a sense of infinity: even of temporary nobility. Our poor Seigneur must have lain here, and extended his signiorial limbs to the right or to the left in those happy days before Samson had held up his head on the scaffold, or before his shoulder had got used to the kit fiddle as *maitre de danse*. Unhappy nobleman, tuning his kit fiddle and pointing his toes to one and sixpence the lesson. Playing so merrily

for Marie and Corydon, and Phyllis and Rosalie on the green. Join hands now, sweet demoiselle. Faster now—play up, marquis! Thrum, tamborine, more vigorously! Round again! Phyllis is my only joy! not in the least tired—not in the least. Bontiquet—ah!

To weary sleepers rude disturbance and cruel wakening are odious. There should be a law in all well-ordered parishes to protect them, and not allow horsemen to come clattering into inn yards at unholy hours. A monstrous grievance for tired men. I heard the fellow ride his beast in, in most unfeeling fashion, with spur and whip, up to the very door: and then halloo louder for some one to take his horse. Presently are heard steps in the gallery, and afterwards in the room separated from me by the tapestry half drawn aside. A sleepy waiter was making up a shakedown or impromptu bed. Bontiquet himself is fast bound in slumber, or he would not have tolerated this treatment. Eyes, however, which seem fitted with leaden rims, must have their way, and will look no more. "We must close up," they say, and so I let them close up.

I am fast slipping away into what may be called muddle-land, when the great posts of the bed began to take, indistinctly, the shapes of the trees I had passed by in the day, and I began my rambles over again through the open country, when I am brought back with a crash to the Seigneur's room. Somebody is tramping about the next room—speaking to himself. Wroth again at this second disturbance, I look out through the tapestry, and see that there is a light burning on the floor, and that a short man, with very disordered looks, is walking to and fro muttering to himself, and stripping off his clothes as he walks. I had seen his face before, but where?—a round cunning face with a scar. Ah! at the gate! One of the ill-looking horsemen. Now I put it to myself with gravity, Was this a discreet position to be in, with such company alongside of one, though even in a Seigneur's apartment? It was a monstrous feature in Bontiquet's ménage, that you were thus liable to be set cheek by jowl with fellows of this complexion—and so—and so—I would complain to—the clock! Rosalie—dance—fandango, thrum, thrum—join hands—all—all!

Profoundest, absorbing slumber. Floating

in sweetest dreams, that bring me back home again. Soft waving meadows, happy trim hunting-grounds, found in the dream-country, and that placid dream sunlight blazing eternally over all; when there comes suddenly a piercing cry shooting through my brain, which makes me start up suddenly, and look round, not knowing whether that dream-country was still about me or no. There was a figure bending over me, a figure in shirt and trousers, a face with a scar across it, but pale, ghastly, and filled with fright and terror. He held the candle in his hand.

"O!" he said, "pour l'amour de Dieu, don't leave me! Help me—aid me—stay with me!"

I rubbed my eyes. The candle was shaking in his hand, and bringing out his ghastly face with strange, Rembrandtish effects. "What is it, in Heaven's name?" I said. And curiously enough, what struck me more than any thing about him, was a great rent down the front of his shirt.

"O, such a night! I would not stay by myself in that room for another instant—no, not for the wealth of a prince!"

"What is it?" I asked. "What has disturbed you?" (How did he come by that rent?)

"Such a terrible thing! It was enough to make one die on the spot. Ah," he went on, wiping away the drops from his forehead, "I knew something of the sort would come of this business! But I was not so bad as the rest!"

"What do you speak of!" I said again, impatiently. "Why have you disturbed me?"

"I thought I was above such womanish terrors. But to see him come in, and glide past me, just as I had seen him only a few hours before—him whom we thought was—" He stopped suddenly, and, seeing there was no explanation to be got from him, I threw myself back wearily.

Here I heard the flapping of the cock's wings, and presently my bell-ringer roars out two o'clock.

"Two o'clock!" continued this strange visitor. "I will go down and fetch out my horse, and go my way. The open road, the darkness, any thing but that horrid spectre!" With that, I saw him thrust on his garments hurriedly, and leave the room. He left the candle behind him, burning on the table.

No more rest for me that night or morning. The sweet weariness was gone from my eyelids, utterly routed. Nightmare, or drunkenness must have been on him. The hound! Could he not have slept off his débauch elsewhere? Now, on those dark roads, and with an unsteady hand on the bridle, he will most likely come tumbling head foremost over his horse's neck, and be found in the morning on the hard stones, quite stiff and stark! Well, on his own head be it.

Whir-r-r! went the flapping wings of the cock. It was one quarter past two.

The candle was burning with a dull yellow light, on a little buhl table with twisted legs, not a yard from the tapestry. Thus it broke up the walls into great patches of black, sprinkling little dribbles of yellow light here and there on points projecting. A faint glimmer reached even as far as the next room, to the cock on the chimney-piece.

Click! click! click! Why, what could that sound signify? Clock running down? No; rather winding up—positive winding of a clock—click! click! in the regular fashion—click! click again! Why this was to be a night of wonders and mysterious—Bah! my brains are astray. These complicated wheels must be busy inside. And, yet, it is like winding—very like. Two quarters past two now, by the flapping of the cock's wings.

The clock was now suddenly shut out from view by something that had stolen in between me and it! Something bending over the yellow light—a face—a figure close by the buhl table! A figure quite still and motionless—dark and solemn—and the face? Why, heavens! it was the poor canon's gentle face returned to us again. So gentle, so sweet, so benign, so angelic, bent over the yellow light; yet with a strange melancholy over it. I called to him in a low voice: "You have been a long way, Canon Dupin, and we have waited for you, but you have come at last." The gentle face moved round slowly, and looked full at me, but did not speak; that is moved into the shadow, but I knew it was looking towards me. "You must be weary," I went on—a curious feeling was creeping over me—"you must be weary with this long night-ramble—very weary?" Was it a light echo that seemed to repeat after me, "Very, very weary?"

"Where have you been wandering all this long night? Have you been sleeping?"

The face was now bending over the yellow light; but the eyes—the gentle eyes—were turned upward. Again, was it a sighing echo that seemed to whisper the words, "Sleeping behind the fountain—behind the fountain?"

A sense of something terrible began to weigh upon my heart. I got up suddenly, went to the window, and threw the shutters wide open. It was daylight; fresh and clear; it poured into the room like a flood. Then I looked to the candle, flaring wretchedly and sickly in that pure healthy light. No one in the room but myself. Whirr-r, flapping! Three o'clock by the canon's clock.

At breakfast next morning—a fine, sunny, inspiring morning, too—out under Monsieur Bontiquet's vines, at a dainty little table covered with wines and dainty fruits—I asked for Monsieur Bontiquet; I was told he had gone to the post-town early, had returned, and had gone away again.

"The truth is, Monsieur," said the person who officiated, "he is troubled in his mind on the score of the poor canon. He was not heard of at the town where we fancied he had passed the night."

"Passed the night?" I said. "Why, was he not here?"

"Here is Monsieur Bontiquet himself," said the youth.

And as he spoke, I saw Bontiquet dismounting from a horse at the door.

"Good morning, Monsieur!" he said. "Our poor canon is not to be heard of. They tell me that he left the town about nine o'clock to join our little festival. Heaven send he has come to no harm! Those three men on horseback——"

"Ah! by the way," said the waiter stepping forward, "one of those gentlemen came here last night, but must have departed again before daylight."

"So he did," I said.

"Mordieu!" said Bontiquet, muttering.

"But," said I, starting, and thinking of what I had seen, "the canon must have been here last——"

A peasant came running across the green, holding up something like a black rag all over mud.

"This was found," he said, "in the ditch by the roadside. It looks like the canon's skull-cap."

People gathered round from all sides.

"It is no other," they said.

There were hairs and clotted blood sticking to it, at the sight of which the gentle-hearted bystanders groaned and wept. All this while I was in a sort of dream, trying to bring back, one by one, the mysterious events of the night. They were coming—coming slowly.

"What can they have done with him?" said one.

"We should try the road both sides—all along to the fountain!"

To the fountain! That soft sighing echo came back at once. Sleeping behind the fountain! behind the fountain! Had it been a dream?

No; for within an hour they came back slowly, those good village souls, with downcast eyes and drooped heads, and brought news that behind the fountain, indeed, had been found their loved canon, quite cold and stiff; with which melancholy messengers came a train of weeping women and children.

"O, sirs," said one, "it was a devilish thing, with no reason in the wide world; for he never was enemy to so much as a fly! Who could have done it?"

"Mordieu!" Bontiquet said, through his closed teeth. "I know well. Too well."

"I saw," said an old peasant, stepping forward, "I saw Dupin the younger with these eyes ride through the village last night, with two other horsemen."

"Ah-h-h!" from all the crowd; and then a pause.

"The same that were at the gate during the dance," Bontiquet added. "Yes, the nephew."

The events of the night before, and its mysterious disturbances, began to take something like shape in my mind. "Had he not a scar across his face?" I asked, hurriedly; "a short, thick-set fellow?"

"Ay," said Bontiquet, "the same."

Here broke in some one: "He was here last night, that man with the scar. I stabled his horse; but he was gone in the morning. He slept inside Monsieur's room."

"I heard some one ride away at dead of night," a guest put in.

"Mordieu! so did I," said another.

"Ha!" Bontiquet said, rubbing his hands; "this looks like business. We shall have him, yet. Fetch your best horses, and we

will go forth together. Hi! Jacques! Bring round the grey horse."

Each man was soon mounted, and off; tearing away, belly to ground, as they say, in different directions.

It was a weary day. I should have been on my road, only I longed to see the end of this strange drama. It came to eleven o'clock; and then to mid-day; to one, to two o'clock. I wandered in and out restlessly; setting out at last on the road towards that fountain. There were groups at the house-doors, and leaning on gates, talking that one engrossing business over. The day was beautiful; the sun shining brightly, and a sweet scent abroad as of new-mown hay. Three o'clock now, by those tinkling church-bells whose music sounded from afar off,—as far, indeed, as Petit-Pont. For this was the very spot where, the evening before, I had parted with the poor canon, then on his errand of charity. There were the marks of that strange diagram he had drawn with his stick, still fresh. Here, a few steps on, was the fountain, christened Blandusian, clattering noisily as ever, but no longer the pure, fresh, innocent stream of the night before. And in the brake behind, was that rough, terrible gap, where he had lain for the long weary night: the rent briars and broken twigs telling plainly of what violence it had been the scene. The bells of Petit-Pont had to chime again and again before I left the place.

Six o'clock. A cloud of dust approaching; people from inns, from cottages, from fields all run out—run hastily to the cloud. They are coming, they are coming! See yonder! It is Bontiquet, it is Jacques; it is everybody

that has gone forth in the morning. There is a procession; there is a buzz of many tongues; there are cocked-hats and drawn swords, many of them; and, as the dust, thickened by crowds pressing round, clears a little, I see the short, thick man in the centre mounted on his black steed. Terrible excitement! bitter execrations! Gendarmes with difficulty keeping the people off. Bontiquet rode at the head. It was his caption.

Said I to Bontiquet, when dismounting, "See, is his shirt torn in front?"

There was a great rent in the breast. It was blood-stained besides. In his pocket, too, a packet of his own letters taken from the Abbé, with ample proof besides. But the bold ruffian made show of denial—laughed the thing off. It was only when he saw me that he suddenly turned pale and trembled.

"You were in the room?" he said, in a whisper. "You saw it; was it not terrible?"

"A thing never to be forgotten. If it comes to me again I shall kill myself."

"Would that night's work could be undone!"

This was the last scene of that little history—the last at least that I witnessed—for that night I was on the road again. But for the guilty there was another road, one more terrible but amply merited.

But the clock! was it a dream? The criminal and I could not both have dreamt alike. He, with his scar and his torn shirt-front, saw the canon wind it up. I saw him wind it up. Everybody saw in the morning that it was wound up. Every mystery was cleared but this.

MADAGASCAR.—There is talk of an expedition against Madagascar by a combined English and French force, to punish the piracies of which the savages of that island have been guilty. From all I can learn, I believe that nothing is yet positively decided, but that the plan is being deliberated upon, and that the necessity of some such measure is recognised. As long ago as the end of the Crimean war an expedition to Madagascar was talked of, and it was said that some regiments suspected of dis-

affection to the present order of things in France were to be employed upon it. The reason then assigned for its not being carried out was the painful tradition preserved in the French army of the expedition to St. Domingo, early in the century, when thousands of the veterans of the Egyptian and Italian campaigns perished miserably of the diseases of the West Indian climate. The suspected battalions were, I have been told, re-shipped for Algeria soon after they reached Marseilles.—*Times Paris Correspondent.*

From Chambers's Journal,
IN A GENTLEMAN'S FAMILY.

YOU, the general public, remember doubtless that I have had difficulties to contend against for these last six or seven years, in getting private tutors for my boys. In the advertisement-sheet of the *Times* newspaper, and under the head of "Education," you cannot but have often perused that rather compact statement, just within the five-shilling charge, of exactly what is wanted in the tutorial line by A. Z., in Derbyshire: "*In a gentleman's family at a picturesque village in the north*"—I put in the word "picturesque," not at all because the prominent feature of the place, which is singularly bleak, is a tumbledown old granary, upon a very unproductive moor, but because I thought it might attract a draughtsman; in which case my boys would gain an accomplishment, in addition to the usual branches of education, which yet should not be an extra—"an opportunity of making himself nobly useful"—the idea which that happy turn of expression conveys is, it is right to state, borrowed from the classics; but the phrase is all my own—"is offered to any gentleman of character and attainments in the capacity of tutor to three intelligent youths. For information regarding salary, &c., &c., apply to Rev. A. Z., Peakton, Derbyshire."

I had some conscientious doubts about referring inquirers to those initials, on account of my surname not beginning with a Z, and of my Christian name being William; but these were overruled by my wife. She objected strongly to my real address being given in the paper, lest it should be supposed—so she argued, and I am not bound to find her reasons, but only to render her obedience—that I was connected with the public press.

"Never," said she, "let me see you so forgetful of what a stock I came of, as to put your name in the columns of a newspaper, William." Nor, indeed, am I likely to forget it, since I am reminded of it every day of my life. It was a great blow to my good lady's importance when Mr. Donald Macdermot of Glengarithcoe, N. B., having answered the advertisement and our requirements, came down to Peakton from his Highland eyrie and ancestral home. He gave us to understand that he was in his own country a personage of great power and dignity, three generations at least in advance (or rather be-

hind) any southern pedigree. He would have preferred, as he confided to his pupils, to have been called by his territorial name of Glengarithcoe had not its inconvenience to our English tongues been too tremendous; but he was known, among ourselves, by a title conferred upon him by my daughter Georgiana—"the Macdermot," as conveying in some degree an idea of the singular and almost ferocious animal which he really was. My wife's ancestral pride was grievously wounded by the assumption of this gentleman from North Britain, while her moral dignity, as you shall hear, received at the same hands, a shock from which she has never completely rallied.

The young man had been with us for a month or two of spring-time; and the first summer day had just arrived when I was awakened from my afternoon nap in the library by a succession of agonising screams from my wife and daughter. I heard them scamper up-stairs into my bedroom, and lock and double-lock the door, after which they began to scream afresh with undiminished vigor. I instantly flew to their assistance on the wings of a husband and a father; but it was long before the hysterical indignation of the ladies would allow them to find words to explain themselves.

"We suddenly came upon Glengar-gar," sobbed my wife.

"Yes," interrupted my daughter, "upon the Macder-der-der-mot at the corner of the gravel-walk."

"Yes; and what do—do—do you think, William," continued her mamma; "there he was, this beau—beau—beautiful tutor of yours without any!"

"Yes, papa," corroborated Georgiana, "without any at all."

"Without any what?" cried I impatiently. "Speak out—what had he not got?"

"No tut—tut—tut—trousers on," exclaimed the wife of my bosom, relapsing into hysterics.

At this moment, "Papa, papa," shrieked my second son from without, in an ecstasy; "there's Donald Macdermot, Esq., walking about in the costume of his native land; and the cook and the housemaid have locked themselves up in the cellar; and he has almost put poor Gus to death for laughing at him."

The young man coolly informed me, in his

defence that he always wore the kilt in hot weather, and recommended me to discard "trews" myself, and take to a shepherd's plaid petticoat of black and white, such as would be appropriate to a clergyman. This reprehensible style of dress (which he persevered in), joined to the fact of my offspring acquiring under his tuition at least as much Scotch as Latin, caused the dismissal of the Glengorith man from my unworthy roof.

Mr. Donaldson Adams, who succeeded the young Scottish chief, was of a very different order. He was the best scholar of his years, and indeed a better than any old or young whom it has ever been my lot to know. He had carried off all the honors that were open to him at his university, both classical and mathematical; and yet he wore them as lightly and as gracefully as a wreath of flowers. How we managed to get him for a hundred guineas a year was always a marvel to me; and the reason which he gave for his acceptance of so humble a post, was itself most eminently characteristic of his beautiful nature.

"I love retirement," said he, "and domesticity; and the approval of such a man as you (he was indeed so good as to say so) is more to me far than the applause of senate-houses. I have had enough of ambition. *Here,*" he would say, laying his thin white hand upon the head of that one of my three boys who chanced to be most convenient—"here lies my future duty, and it is one that is inexpressibly dear to me."

My wife averred that it was quite a privilege to have such a young man as Mr. Donaldson Adams in our house. Georgiana raved about him to that extent, that I had to remind her that, although when house and land are gone and spent, learning might be most excellent, still it was better to have house and land to begin with; and that Mr. Adams, however eligible in other respects, was not, in his present circumstances, the man for my son-in-law. The families in the neighborhood expressed themselves indebted to me for the introduction of such an Admirable Crichton into the county. Nay, he completely cut out the pet Puseyite curate in the market-town among his own female disciples; and the member for the borough himself spoke to him in public, affably, upon two distinct occasions.

Mr. Donaldson Adams was indeed at the

apex of his popularity at the very moment when the whole edifice of it came down with a crash. If he could but have managed to hold on to his tutorial position for another six weeks, I think it as probable as not that he would have received a piece of plate; but this he could by no means do. The restraint which he had put upon his disreputable nature for half a year could be no longer maintained. He cast his slough of respectability, and came out, harlequin-like, when you least expected it, in his own proper colors at once.

My watch, my wife's watch, the cook's watch, Bob's silver mug, given to him by his godfathers and godmothers on his baptism, Gus's opal ring left to him by his great-aunt—every thing of value, in short, which he could possibly get lent to him upon any pretext by anybody, Mr. Donaldson Adams had pawned at various county-towns within a radius of sixteen miles from the rectory. He was so good as to write out a neat and accurate account of the respective places where each of these articles was to be found, and to leave it upon my study-table, when he departed at three o'clock on a certain morning, after having received his quarter's salary overnight. It would wring my heart to recapitulate the many crimes of that abominable young man. It is sufficient to state, that in him I nourished a serpent of the worst description in my bosom, and that he took advantage of that situation to pick my pocket of a very considerable sum. There was nothing true in the account he had given of himself in answer to our advertisement, except his statement of his university career, which was one-half correct—the half which related to his honors; the dishonorable part, containing an expulsion and other matters, he kept religiously to himself. "His worst he kept, his best he gave," as the poet sings; and I am sorry to say, recommends in addition. He certainly was, however, an admirable scholar, and taught my three boys of thirteen, fourteen, and fifteen years old, respectively, to make the neatest cigarettes that I ever saw, and to smoke them.

Our advertisement was answered many times after that without our getting suited. Mr. Adams had, among other wickednesses, caused a domestic rupture between myself and my wife. She had the hardihood to observe, with reference to that young person, that what had occurred was all my doing;

that she herself—she even went to that length—had seen how things would be from the beginning; and that I “ought to have known.”

“Good,” replied I; “in future, madam, you shall choose the tutor yourself.”

Like that well-known political nobleman who has been said to be ready to undertake the superintendence of any department of war or science at ten minutes' notice, my wife is impressed with a full sense of her universal fitness, and she accepted the post upon the instant. She examined the different candidates who presented themselves at the rectory, as teachers of the young idea, just as she was accustomed to interrogate the applicants for her housemaids' situations—namely, with her hands behind her, and with an expression of countenance at once suspicious and patronising: it was long, therefore, before each party came to terms. Mr. Joseph Buttamuth, a washed-out individual of a whity-brown complexion, and with unreliable knees, was at last the lucky man. He was so young that he was not only whiskerless, but had not even the down which gives the promise of whiskers; he could not be said to walk so accurately as to shamble; he termed his future pupils, to their great merriment, “the boyth,” and when I asked him if he had ever taught boys before, he answered, “Yeth, thir.”

Nevertheless, it is but right to say that Mr. Buttamuth fulfilled all the tutorial duties that were required of him; it was not in the bond that he should be a conversable companion to me, as well as a teacher of my children; still, after Mr. Donaldson Adams, poor Buttamuth did certainly seem a most uninteresting companion after the ladies had left the dinner-table, and not the less so, perhaps, that he had been chosen by my better-half. However, he was harmless. Our character and

our watches in his hands were safe at least. He never came down to breakfast with a black eye in the morning, and the excuse that he had the misfortune to sleep on his fist. He was simplicity and guilelessness personified. For example, speaking to him one day of his chances of promotion in the church, for which profession he was steadily qualifying, I made use of the expression: “If you play your cards well, you may be a bishop;” to which the unsophisticated young fellow rejoined: “Ah, thir, but the misfortune is that I *don't know how to play cardth.*” Photography was his only joy. He took my own likeness from every possible point of view, in canonicals and in *déshabille*, on glass and on paper. He took my wife and daughter, and the three “boyth,” and the servants, full length and half length, full face and in profile, individually and in groups. My daughter Georgiana was instructed by him in this delectable art. Fool that I was, to think that all was collodion and innocence, instead of being design and camera obscura! One day—a capital day for photographing, what he called, in his absurd jargon, “a white day,” but which I do not consider “a white day” by any means—while he was taking a “negative” of my daughter, he proposed to her at the same time, and she gave him an affirmative. The whole thing, as Mr. Buttamuth had the effrontery to tell me afterwards, was almost “simultaneous” (another of his ridiculous terms); every thing was then settled, except the asking the consent of her parents—the drying process, I suppose—which they put off till after their wedding. Mr. and Mrs. Buttamuth are now trying in a Westmoreland curacy the problem of a frugal marriage on £120 per annum; and they have already, to enhance the experiment, a couple of baby “boyth.”

AM RHEIN.

Oh! the Rhine—the Rhine—the Rhine—
Cemme c'est beau! wie schön! ché bello!
He who quaffs thy Luft und Wein,
Morbieu! is a lucky fellow!
How I love thy rushing streams!
Groves of ash, of birch, of hazel;
From Schaffhausen's rainbow beams,
Jusqu'à l'écho d'Oberwesel.

Oh que j'aime thy Brüchen when

The crammed Dampschiff gaily passes,
Love the bronzed pipes of thy men,
And the bronzed cheeks of thy lasses.

Oh! que j'aime the “oui,” the “bah!”

From thy motley crowds that flow!

With the universal “ja,”

And the allgemeine “so!”

—Punch.

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From The Philadelphia North American.
THE PUBLIC PARADE OF PRIVATE DIFFERENCES.

THE readers of newspapers have, for some time, been regaled with comments and speculations on the domestic difficulties of the celebrated novelist, Mr. Charles Dickens. We have forborne any editorial remarks upon the matter, and do not purpose to say any thing now with particular reference to the parties about whom there seems to be "the Dickens to pay." It does impair our faith in the reform of human nature by novel writing, somewhat, we acknowledge, to find this pen and ink high priest of the domestic altar, unable to keep the incense to the Lares and Penates properly asmoke on his own hearth. In the best aspect in which we have been able to view the matter, Mr. D. seems to have failed wonderfully in the philosophy of his own heroes. Old Weller behaved infinitely more wisely than Mr. D. has, even allowing Mrs. D. to have been as hard to manage as the good woman who presided at the tap of the Marquis of Granby. And there is more than a suspicion, in some minds, that Mrs. D. has been the figure on which Mr. D. has hung the Drapery of several of the inefficient and impracticable wives which he delights to paint. We can trace a family likeness among them all. Incapable, as Mrs. D. is said to be, of appreciating her husband's funny genius, she is therefore all the more capable of suspecting that fun is poked at her. But we forget. We premised that we meant to say nothing about these good folk in particular, and are going on as wisely as the Dickens himself. He declared, or very plainly intimated, that he is resolved to say nothing, and then proceeds with letter, and poem, and letter, till we are like to get a volume of domestic miscellanies—not half equal to poor, dear defunct Cawdle's Lectures.

But on the general subject. Every man and woman has a character of individuality. Those who are most characterless in the eyes of the world, are really as distinct in their idiosyncrasy as their more conspicuous neighbors. The difference between them is that between chalk and cheese. But chalk is as positive in insipidity as cheese in pungency. People who marry must come together prepared, having found each other out, to accommodate themselves to each other. If they have made a bad bargain, all that is left them is to make the best of it. Any thing is better than to quarrel; and especially to quarrel, no matter how politely, in such a way that the public hears of it. Above all should pronouncements through the press be avoided. Legal steps may sometimes be imperatively necessary; but the parties in such a case, no

matter what third parties may print or say, should never, by themselves or their friends, stoop either to vindicate or to assail. Public opinion never can be settled by newspaper appeals in a family difficulty. The respective friends of each will adhere to each, and the scandal-loving portion of the public will believe all the ill that is spoken of both, and imagine much more. No position can be worse than that of those who throw their private matters before the public eye. The victor in the contest is only not so unfortunate as the other; and a party really in the wrong may seem to have the better cause by maintaining silence.

So in the quarrels of former friends, and, indeed, in all private differences. "Least said, is soonest mended," is the proverb, "is soonest mended." But what is written may not be mended at all. The real difficulty in compromising or healing any difference, is not so much in prevailing upon the disputants themselves to be reconciled, as in inducing them to forget that others have heard them commit themselves. Sensible married people have their quiet tiffs and reconciliations, without any outside witnesses, and the little quarrel and reconciliation both are forgotten. So do partners differ quietly. So do friends. But the moment you have admitted one witness you have prolonged the difference. Make it the subject of neighborhood gossip, and you lengthen it still more. Put it in the newspapers in any shape, and the arrival of a condition of irreconcilable feud is only a question of time. No patching can entirely remedy the difficulty; because nothing can entirely remove the shame that the parties feel that they have exposed themselves to public animadversion. Each is anxious to place the folly of the exposure upon the other, and new disputes arise which throw the original difficulty entirely out of sight. The sated public, tired at length even of scandal, heartily denounces both, or mischievously laughs at them, which is even more provoking.

Keep, then, your quarrels out of the newspapers, and submit to a small wrong, or even a serious one, without wasting printers' ink upon it. The foolish personal twaddle and scandal which finds its way into print, is really the disgrace of the age. Those of us who happen to know sensible people who, with the infirmity of human nature, have differed, and yet with the delicacy of true good breeding, have kept their private griefs from the public eye, can testify how highly we honor them. We respect even the faults of those whose true nobility of character keeps them above the meanness of an appeal to a public which has no concern in their private matters. He is very forgetful of his own self-respect who tries to bolster himself with public sympathy.

From The Spectator.

The Butterfly Vivarium, or Insect Home.

By H. Noel Humphreys, Author of "Ocean Gardens," &c.

AN application of the principles of the aquarium to the study of insect life and transformations, with descriptions for the arrangement of the case and the management of its inhabitants. As far as the author's clearness of direction goes the "butterfly vivarium" is as easy to keep as an aquarium, and the observation of insect metamorphosis exhibits more wonderful processes than can be seen in the growth of fishes. We suspect that the insects require minuter care and closer observation than the piscine tribes, and perhaps there is less sympathy with an insect than a vertebrate animal. This, however, is a matter of individual feeling.

The account of an instructive, amusing, and elegant experiment is not the only feature of *The Butterfly Vivarium*. In a summary review of the four stages of insect life—egg, larva, pupa or chrysalis, and butterfly, Mr. Noel Humphreys popularly exhibits some of the most singular examples of transformation, yet showing that wonderful as they appear to the superficial observer, the metamorphoses are in reality but development, minute germs of the future organs being ever traceable. In further chapters he gives particular accounts of some of the most remarkable insects, regard being had to their fitness for the "vivarium." Here are a few miscellaneous samples of the book.

Periodicity of Insect-Hatching.—"Many experiments have been made with the view to accelerate the hatching of insect eggs by the stimulus of heat, and to retard them by the application of intense cold; but, except in a very few cases, little or no effect was produced—periodicity, rather than any kind of atmospheric influence, being the governing power which regulates the hatching time. In some few instances, however, as stated, the time can be accelerated by warmth—as with silkworms, for example—which is, perhaps, owing to their existence in Europe being altogether artificial, and their instincts being more or less thwarted and confused in all their stages. It has been found much more difficult, and in many cases impossible, to retard the period of hatching by any degree of cold; and certain eggs destined to hatch in June, for instance, will, according to Brahm, hatch at that time even in an ice-house."

Preserved Insect Food.—"In some cases the food for the young has to be positively

provided, and even placed in a proper situation, by the parents; and this they never fail to effect with the greatest completeness, whatever may be the cost of labor necessary to effect the arrangements; and although they never live to see the happy results of their contrivance, as the eggs are not hatched till after they have perished, which they invariably do when they have performed that last and most important act of their existence.

"Other species kill insects for the express purpose of placing them in a subterranean larder to become the food of their progeny as soon as the eggs placed near the prey are hatched; and the Mason Wasp builds up the bodies of caterpillars in the structure in which its larvæ are to come forth, taking care to select such as are just about to change, and which are consequently unlikely to attempt escape, being in a semi-dormant state, in which they remain as nice, fresh, live food for the carnivorous young as soon as they are hatched. The Spider Wasp pursues a similar method in providing a feast of spiders for its expected young—just stinging the victims sufficiently to prevent any attempt to escape, but not to kill them."

Butterfly's Egg-nest.—"This little insect is, however, by far surpassed in the skill displayed in her maternal cares by some kinds of butterflies, which may be said to build a positive nest for their eggs, precisely similar to that constructed by birds, except that it is not used for the purpose of incubation, the eggs being abandoned so soon as properly protected in the manner which instinct has suggested to the parent. The interior of this nest is formed by several layers of soft down which the female plucks from her own body, and upon this delicate couch the eggs are deposited, and then protected by an elegant covering of the same material, often arranged with very curious intricacy. In some cases this covering is disposed in such a manner that each silken hair remains erect, the nest thus enclosed having the appearance of a small patch of the softest and most downy fur. Some times, when the eggs are laid spirally round a branch, this kind of covering naturally follows their course, and it then produces a very beautiful appearance, which it would sorely puzzle a tryo in entomology to account for, as it often assumes the appearance of a minute bottle-brush, and at other times that of a miniature fox's-tail. By the time this final protection to the eggs is completed, the body of the devoted parent, as may be imagined, is almost entirely enuded of its beautiful silky clothing; but she has fortunately no further occasion for it, as having thus completed the last act of her brief existence, she almost immediately expires."

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